# The Chemical Age

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## Contents

| | PAGE |
|---|---|
| EDITORIAL NOTES: Proofs of Progress; Small Works and Neutral Sulphate; Dr. Levinstein's Verdict; Industrial Poisoning | 251 |
| Neutral Sulphate of Ammonia Difficulties | 254 |
| Analytical Control: Dr. Callan | 255 |
| Progress and Prospects of the Dyestuffs Industry | 256 |
| Institute of Chemistry: President's Address | 258 |
| Review of British Chemical Progress Since 1914 | 259 |
| Works Chemists and Industrial Poisoning | 260 |
| Centrifugal Force and Varnish Clarification | 261 |
| Improvement in Heat-Resisting Glasses | 262 |
| From Week to Week | 265 |
| References to Current Literature | 266 |
| Patent Literature | 267 |
| Market Report and Current Prices | 271 |
| Manchester Chemical Market | 272 |
| Scottish Chemical Market | 273 |
| Company News; Trade Inquiries; Tariff Charges | 274 |
| Commercial Intelligence; New Companies Registered | 276 |

*NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.*

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## Proofs of Progress

THE statements just issued by the Association of British Chemical Manufacturers on the progress made in fine chemicals and dyestuffs since 1913 are the more impressive because of their studiously moderate character. The facts are left to speak for themselves, without embellishment and without too great an insistence on the "national security" argument, which perhaps has been a little overdone; and they speak convincingly. Taking first of all the fine chemical industry—in spite of the high cost of new building and plant following the Armistice, the effect of the Sankey judgment in flooding this country with foreign supplies, the great advantage given to German competitors by the discrepancy in the exchange, and the general depression of trade now happily disappearing—progress has already reached a point which a few years ago would have seemed impossible. Statistics drawn from a few firms show that where 100 British chemicals were manufactured in 1913, 1,400 are now being produced, and for every ton made in 1913, two-and-a-half tons are being made to-day. The industry as a whole is at present producing several thousand different chemical substances, many on the large scale, others only on the small scale, as, for instance, analytical reagents and research chemicals. Although in the latter cases the manufacture of each substance is a small thing individually, collectively they constitute an important industry, which, in addition to supplying the nation with essential needs from within its own resources, provides training and employment for skilled chemical workers.

Purity in the case of fine chemicals should be above suspicion, and here again the testimony is conclusive. Independent reports are cited to show that British analytical reagents and research chemicals have stood severer tests than those applied in pre-war times to the products of Merck, Shuckhardt and Kahlbaum, and it is confidently claimed that in many respects they are superior to German products of to-day. Although, perhaps, for the moment the prices of British products are higher than those of foreign competitors, they have not been advanced in consequence of the Safeguarding Act; on the contrary, any price changes have been in a downward direction. A year ago a comparison between the price list of a prominent British firm and Kahlbaum's pre-war price list showed that the British products were then only 29 per cent. higher than the German pre-war products. An increased output in British fine chemical manufacture, resulting in lower costs of production, has enabled a further reduction in prices to be made recently, so that British prices to-day show an all-round reduction as compared with a year ago. If these results are not directly due to the Safeguarding Act, at least the Act has not prevented them from being attained. With all this progress before us it is inconceivable that the work so well begun should be discontinued or weakened just when the first-fruits are beginning to appear.

Our experience in connection with the dyestuff industry is very much the same in character, perhaps even more striking. The dramatic contrast between the pre-war and the post-war position is indicated by one single fact. In 1913 at least 90 per cent. of the dyestuffs required by the various consuming industries were obtained from foreign sources, and of the 10 per cent. of British origin many were merely foreign dyestuffs mixed in British works. In 1922 about 80 per cent. of British requirements were obtained from British sources and only 20 per cent. required to be imported. These British dyestuffs are, moreover, really products of British manufacture and not derivatives of foreign intermediate products or mixtures of foreign colours. Our productive capacity has thus advanced from a negligible figure in 1913 to a volume of not less than 40,000 tons per annum to-day. So large, indeed, is our output that export trade must be developed to absorb a percentage, and the remedy seems to lie in our own Colonial markets. Apart from the security thus given to our textile industry there has been a marked development of other dyestuff consuming industries such as the manufacture of dry lake colours and pigments for inks

and paints. As regards quality, the fact that many foreign dyestuffs are excluded under the Act with the assent of consumers is good evidence of the character of the corresponding British products.

Admittedly a vital question is that of price. No one has yet accused the British dyestuff manufacturers of any attempt to exploit the situation in order to establish or maintain artificial price levels. No one can say they have been making exorbitant profits. Prices, in conformity with those of other commodities, have consistently fallen from the middle of 1921 to the present time. At the former date the average price of all classes of British dyestuffs was slightly over 4s. 4d. per lb.; by December, 1922, it had dropped to slightly over 2s. 6d. per lb. Consumers naturally would welcome further reductions, having regard to the prices at which German products can be obtained, but the restricted demand for dyestuffs in this country has prevented the industry from operating to full capacity, and relative costs of manufacture are thus increased. There is no concealment of the fact that the British industry could not compete openly with the Germans, while the latter retain abnormal power to manipulate prices, without the protection of the Dyestuffs Act or some substantial measure of financial assistance. Not the least important aspect of all this progress is the organisation for research which has grown up, especially in the realm of organic chemistry, and the provision of a highly-trained school of organic chemists whose knowledge and abilities are available for any problem in times of emergency.

That the present situation is complete or perfect no one will contend. We have repeatedly emphasised the point that for the establishment of a British self-dependent industry some temporary price must be paid. The price has been less than many feared, and it should steadily decline; the results obtained for the price have been far in excess of what anyone could reasonably have predicted. In such circumstances is any policy even thinkable save the policy of pushing the work forward to the final triumph fast coming into view?

## Small Works and Neutral Sulphate

In our issue of February 10 we drew attention to the difficulties which beset the small-scale producer of sulphate of ammonia who, though anxious to comply with the recommendations as to quality which emanate from the British Sulphate of Ammonia Federation, finds that the capital expenditure which the alterations involve would in many cases prove a burden which the undertaking could not bear. Really effective plant for the production of dry neutral salt presents the difficulty that it cannot be improvised from materials which are available at the works, and a further drawback which is attached to a fairly considerable capital expenditure on new plant is that the plant is only in operation for perhaps three months in the year, and it is not, therefore, a quick or constant revenue earner. In the majority of the smaller works, in fact, it is the custom to accumulate a stock of ammoniacal liquor and to work this off into sulphate of ammonia about once a fortnight, so that for the greater part of the year the money expended will be lying idle.

Elsewhere in this issue will be found an article by a correspondent who has for some years been in close touch with problems connected with sulphate of ammonia manufacture. Several points of considerable practical interest are raised in this article, but perhaps the most important is the reminder that processes for effecting neutrality which may be in successful operation in large establishments are frequently impracticable when applied to small works. There seems, moreover, to be a general misunderstanding that neutralising and drying processes are calculated to remedy the inferior qualities of acid-containing salt, whereas such processes in reality are not intended to rectify defects of the kind. In other words, if real success is to be achieved, attention must first be turned to the original process of production, and the inherent defects must be eliminated from this. Our correspondent would seem to suggest that the small producers need not necessarily attempt to keep pace with their bigger colleagues and produce a high-grade neutral product, but they might well be content (by carefully controlling the acidity of the saturator bath, and by installing a centrifugal dryer) to produce a better quality of acid-containing salt—*i.e.*, having 0·3 per cent. of acid and 0·3 per cent. of moisture. No doubt such a salt would have much to commend it when contrasted with the usual variety containing 0·4 per cent. of acid and so much as 3 per cent. of moisture.

Another significant suggestion is that the larger producers should act as "refiners" for the smaller works. That is to say, the latter should send their low quality salt to the big works for neutralisation and drying. In certain instances where local conditions are favourable such a scheme might be operated with advantage, but it can only be regarded as a substitute for something better. Normally the processes of drying and neutralisation are part and parcel of the original manufacturing process, and they should be carried out as an immediate sequel to the production of the salt. The idea of making the two operations discontinuous is not altogether attractive from the chemical engineering standpoint, but it might well bear consideration by those who cannot for financial reasons do the work for themselves.

## Dr. Levinstein's Verdict

Dr. Levinstein made two notable utterances on the dyestuffs situation last week—on Friday at a combined meeting of the Manchester and Liverpool Sections of the Society of Chemical Industry, and on Saturday at the annual meeting of the Association of Technical Institutions in London. He has spoken but little of late on a subject upon which he knows and thinks much, and there is a quality of loyalty about his silence which deserves and will command respect. Now when he does speak there is no word of criticism, complaint, or dissatisfaction; on the contrary, his verdict on the present position is one of generous approval and satisfaction, and his influence is thrown wholly into the scale on behalf of British enterprise. A frank opinion from Dr. Levinstein is worth having, for his knowledge of both the technical and the commercial sides of dyestuff production is comprehensive and intimate, and the favourable view he takes of British progress since 1914 will bring confidence and

encouragement to all engaged in the industry. Still better would it be if a way could be found of bringing his admitted gifts once more into the service of the industry.

Anyone reading through Dr. Levinstein's addresses and the paper by Dr. Hodgson reported last week, can hardly resist the conclusion that the case for the development of the dyestuff and fine chemical industries in the future is overwhelmingly strong, as is also the fact that this development must be largely dependent on research on a generous scale. This is now gradually being recognised, but it is essential that the research should be carried out on the right lines. Any false economy in this direction would defeat its own object. The efficient research worker must be able to take the broadest view of the whole field of the industry in order to visualise its possibilities and do original work, and for this a sound general education is necessary. We are heartily in agreement with Dr. Levinstein's statement that nothing is so harmful as early specialisation. The prospective dye research worker also requires a sound and broad knowledge of organic chemistry, as a basis for the specialised knowledge, which he will then readily and rapidly acquire in the works.

As far back as 1862, Professor Hofmann, the German chemist, predicted that " England will beyond question at no distant date become the greatest colour-producing country in the world." Owing to short-sightedness, both in commerce and in science, this prophecy was not realised; but now having been stimulated by economic necessity it is on the way to fulfilment. With the encouragement of research there is no reason whatever why this country should not produce dyes and fine chemicals in quantity and quality absolutely second to none.

## Industrial Poisoning

THE discussion which followed Dr. Legge's address on " Industrial Poisoning " at the London Section of the Society of Chemical Industry on Monday, resulted in two practical points. One was that a conference should be organised between works doctors and works chemists on the subject, with a view of exchanging views and experiences, and arriving possibly at some practicable conclusions. The other was that the works chemist should have larger powers in such matters. Complaint was made in the course of the discussion that works chemists were rather overlooked, although in this case their knowledge is of the first importance. This seems a case in which their position as a class might be asserted with advantage to the workmen and to the management. Dr. Legge's view, however—and it seems to us fundamentally sound—is that the subject should be approached from the reform rather than from the precautionary point of view. It is excellent, of course, that where accidents happen they should be treated promptly and effectively, and that where dangers exist the workmen should be made aware of them beforehand and protected as far as possible from them. But the ideal arrangement, as Dr. Legge pointed out, is such a standard of cleanliness and of perfection in plant and process that elaborate precautions become unnecessary and risks are brought to the irreducible minimum.

## Points from Our News Pages

Dr. Levinstein reviewed the present position in the Chemical and Dyestuffs industries in meetings last week in Manchester and London (p. 259 and p. 256).

The question of industrial poisoning and the chemist's part in minimising it, was discussed at a meeting of the London Section of the Society of Chemical Industry (p. 260).

Mr. A. Chaston Chapman, at the annual meeting of the Institute of Chemistry, reviewed the progress in the organisation of the profession of chemistry under the Institute (p. 258).

A paper was read by Dr. Callan at Manchester on February 27, emphasising the importance of analytical control to the dyestuffs industry (p. 255).

Our London Market Report records active business this week with a satisfactory export demand (p. 270).

According to our Scottish Market Report, there has been good inquiry during the past week (p. 273).

### Books Received

DYES AND THEIR APPLICATION TO TEXTILE FABRICS. By A. J. Hall. London: Sir Isaac Pitman and Sons, Ltd. Pp. 118. 3s.

THE MANCHESTER GUARDIAN " COMMERCIAL YEAR BOOK," 1923. Manchester: The *Manchester Guardian*, Ltd. Pp. 160. 2s. 6d.

THE CHINA CLAY WORKS IN CORNWALL AND DEVON OF ENGLISH CHINA CLAYS, LTD. Cornwall: English China Clays, Ltd. Pp. 70.

THE " RAPID " DECIMAL CALCULATOR AND UNIVERSAL RECKONER. By J. Gall Inglis. London and Edinburgh: Gall and Inglis. 1s. 6d.

OPTICAL METHODS IN CONTROL AND RESEARCH LABORATORIES. By J. N. Goldsmith, S. J. Lewis, F. Twyman. London: Adam Hilger, Ltd. Pp. 56.

## The Calendar

| Mar. | | |
|---|---|---|
| 12 | The University of Birmingham Chemical Society: " The Science of the Alchemists." D. L. Woodhouse. | Birmingham. |
| 12 | Royal Society of Arts: " Accurate Length Measurement." J. E. Sears. 8 p.m. | John Street, Adelphi, London, W.C.2. |
| 12 | The Ceramic Society: " Note Books of Josiah Wedgwood," Dr. J. W. Mellor and Bernard Moore. 7.30 p.m. | Central School of Science and Technology, Stoke-on-Trent. |
| 13 | Mineralogical Society: Meeting. 5.30 p.m. | London. |
| 13 | Northern Polytechnic Institute, Chemical Association: " The Construction and Equipment of Chemical Factories and Laboratories." T. P. Bennett. 8 p.m. | Holloway, London, N. |
| 13 | Institution of Petroleum Technologists. Annual General Meeting. Address by Professor J. S. S. Brame. | John Street, Adelphi, London. |
| 13 | Hull Chemical and Engineering Society: " Illumination." W. W. Chisholm. 7.30 p.m. | Photographic Society's Rooms, Grey Street, Hull. |
| 15 | Chemical Society: Papers by E. H. Usherwood, M. A. Whiteley, H. H. Morgan, T. M. Lowry and others. 8 p.m. | Burlington House, Piccadilly, London. |
| 16 | Society of Chemical Industry (Liverpool Section): " Some Aspects of Fractional Distillation." A. Brittain and C. Elliott. 6 p.m. | The University, Liverpool. |
| 19 | Chemical Industry Club: Monthly Meeting. 8 p.m. | Whitehall Court, London, S.W. |

# Neutral Sulphate of Ammonia Difficulties

FROM A CORRESPONDENT

THE article appearing in your contemporary, *The Gas World* (Coking Section) of February 3 last, together with the comments you make in your leader of February 10, under the above heading, must have aroused considerable interest in this subject. As you rightly point out, there is a tendency to overlook the fact that the manufacture of sulphate of ammonia is in the hands of a large number of distinct undertakings, the output of which varies almost as widely as the several essential factors involved in manufacture.

Processes in successful operation at large works are not applicable to small works, because economic and other considerations render such methods impracticable. Equally, processes which have proved eminently suitable at works operating plant which involves the distillation of gas liquor in the manufacture of ammonium sulphate are unfitted for application to works where the semi-direct or direct processes are in vogue.

The manufacture of dry neutral sulphate for small works is a proposition fraught with some difficulty, whereas with larger works producing ten to eighty tons per day the problem is relatively more simple. Unfortunately some of the technicians responsible for the manufacture of sulphate of ammonia at small works appear to be under the impression that neutralising and drying processes are calculated to remedy the inferior qualities of the acid-containing salt, and one finds a certain laxness in the production of the latter product. It cannot be too strongly emphasised that neutralising and drying processes are not intended to rectify defects of the character outlined. If the supplementary processes under discussion are to be really effective in the production of a super-quality salt, then a better quality acid-containing product, *and not a worse*, must be aimed at. In other words, neutralising and drying processes were never designed to be a corrective for defects inherent in the manufacture of the acid-containing sulphate.

Managers of small works manufacturing one to two tons of sulphate of ammonia per day are beset with economic considerations the moment they contemplate the production of the neutral dry quality. Hitherto, in the generality of cases, such works could not afford the installation of a centrifugal dryer, and managers hesitated to incur such capital expenditure, amounting, as it did, to about two hundred and fifty pounds for the smallest works, in the absence of an assurance that additional plant would be unnecessary for the production of the neutral dry quality. The introduction of a centrifugal drying machine alone will not ensure the desired product, but it will go a long way towards aiding its production.

Where a continuous feed of acid is arranged, and definite steps are taken to maintain the acidity of the bath within the limits of 5 to 6 per cent., no difficulty should be found in producing an acid-containing salt having 0·3 per cent. of $H_2SO_4$, and 0·3 to 0·35 per cent. of moisture, provided a centrifugal drying machine, along with atomised tepid water, is employed, and the salt is dealt with in known manner after being discharged from the hydro extractor.

The procedure just suggested leads to the production of a good type of acid-containing salt, but if it is intended to manufacture the dry neutral quality (this ordinarily implies ammonium sulphate containing not more than 0·025 per cent. of $H_2SO_4$, with a moisture content not exceeding 0·1 per cent.), the obvious step is to pass the acid-containing sulphate hot into a dryer, so that advantage is taken of the heat possessed by the salt.

A very suitable type of dryer is the one built on the lines of a metallurgical furnace, having about four shelves with central shaft, arms and rabbles, revolving at a very slow speed. Such a dryer (embracing elevator), used in conjunction with hot air, should not cost more than £250 for small works manufacturing between two and six tons per day.

If simultaneously with the drying of the moist sulphate a volatile ammonium salt such as ammonium carbonate or ammonium sulphite is used, and one or other of these neutralising media is introduced at the elevator boot as the acid-containing salt is being discharged from the centrifugal and is about to be elevated to the dryer, definitely neutral and dry sulphate can be ensured.

It will be found that the capital cost of a neutralising and drying plant of the type indicated for a works manufacturing about two tons of sulphate per day will be approximately the same as for a works manufacturing six tons per day. The extent of this capital expenditure, embracing self-contained steam-driven centrifugal, elevator, and metallurgical furnace type of dryer, with fan, etc., for hot air, will be about £500, including all equipment.

The cost of producing neutral dry sulphate will be represented by the cost of the power to drive the centrifugal, elevator, shelf dryer and fan for hot air—say 8 h.p. in all. Such plant need not work more than seven hours for the production of two tons per day, or twelve hours for a production of four tons, or eighteen hours for the production of six tons per day.

Basing on an acid content of 0·3 per cent. $H_2SO_4$ in the acid-containing salt, 6¼ lb. of commercial ammonium carbonate or a corresponding quantity of ammonium sulphite will be required per ton of sulphate neutralised.

Thus the cost of producing dry neutral salt will be approximately as follows :—

TWO-TONS PLANT (OR 400 TONS PER YEAR).

| | £ | s. | d. |
|---|---|---|---|
| Say, 12½ lb. ammonium carbonate at 5d. .. | 0 | 5 | 2½ |
| 8 h.p. per hour for 7 hrs. at 1d. per h.p. hour .. | 0 | 4 | 8 |
| Interest and depreciation on £500 at 10 per cent. =2s. 6d. per ton, or for 2 tons .. .. .. | 0 | 5 | 0 |
| R. and M. .. .. .. .. .. .. | 0 | 0 | 6 |
| 1½ cwt. of coke for drying at 1s. 2d. .. .. | 0 | 1 | 9 |
| | £0 | 17 | 1½ |

$\frac{17s.\ 1\frac{1}{2}d.}{2\ tons}$ = 8s. 6¾d. per ton for neutralising and drying.

FOUR-TONS PLANT (OR 800 TONS PER YEAR).

| | £ | s. | d. |
|---|---|---|---|
| Say, 25 lb. ammonium carbonate at 5d. .. .. | 0 | 10 | 5 |
| 8 h.p. per hour for 12 hrs. at 1d. per h.p. hour .. | 0 | 8 | 0 |
| Interest and depreciation on £500 at 10 per cent. =1s. 3d. per ton, or for 4 tons .. .. .. | 0 | 5 | 0 |
| R. and M. .. .. .. .. .. .. | 0 | 0 | 9 |
| 2½ cwt. of coke for drying at 1s. 2d. .. .. | 0 | 2 | 11 |
| | £1 | 7 | 1 |

$\frac{27s.\ 1d.}{4\ tons}$ = 6s. 9¼d. per ton for neutralising and drying.

SIX-TONS PLANT (OR 1,200 TONS PER YEAR).

| | £ | s. | d. |
|---|---|---|---|
| Say, 37½ lb. ammonium carbonate at 5d. .. | 0 | 15 | 7½ |
| 8 h.p. per hour for 18 hrs. at 1d. per h.p. hour .. | 0 | 12 | 0 |
| Interest and depreciation on £500 at 10 per cent. =10d. per ton, or for 6 tons .. .. .. | 0 | 5 | 0 |
| R. and M. .. .. .. .. .. .. | 0 | 1 | 0 |
| 4 cwt. of coke for drying at 1s. 2d. .. .. | 0 | 4 | 8 |
| | £1 | 18 | 3½ |

$\frac{38s.\ 3\frac{1}{2}d.}{6\ tons}$ = 6s. 4½d. per ton for neutralising and drying.

By adopting the plant and process outlined, neutral dry sulphate having the following composition can certainly be made at comparatively small works, given suitable chemical control :—

| | Per cent. |
|---|---|
| Moisture .. .. .. .. | 0·1 |
| $H_2SO_4$ .. .. .. .. | 0·01 |
| Mineral residue .. .. .. | 0·05 |
| Ammonia .. .. .. | 25·6 to 25·65 |

It is known that the disadvantages of mineral residue and comminution of the sulphate crystals can be avoided by (*a*) using a volatile ammonium salt, and (*b*) by employing a dryer which fulfils not only the function of desiccation, but ensures admixture of the neutralising medium by the formation of alternate decreasing and increasing concentric furrows and cones in such a way as largely to obviate trituration.

But the economic aspect cannot be ignored, and if calculations such as those given for two, four and six tons per day plants were furnished in progressive gradations, it will be seen what a clear advantage the larger works possess from the point of view of economy of manufacturing costs.

Clearly, the question arises whether the acid-containing sulphate made by the smaller works, say, up to four tons per day capacity, should not be sent to a centrally-situated larger works for conversion to the dry neutral quality. If such a course were ultimately decided upon, the necessity for a standard quality acid-containing salt should be emphasised in order that the supplementary processes under review are not called upon to rectify defects innate in the manufacture of the acid salt.

Of course, small works are not confined to the adoption of the plant and process indicated, but certainly none of the other processes available, apart from a washing process, is calculated to give a better final product at a much less cost. The use of lime or soda ash as neutralising media is to be deprecated for other reasons than that they give rise to an appreciable ash content.

Sodium sulphate and calcium sulphate—the resultant products following neutralisation with soda ash and lime—have a peculiar tendency to absorb moisture, and to cause cementing, from which an ash-free neutral sulphate should be largely immune.

Approaching now the problems raised as affecting sulphate of ammonia produced at semi-direct and direct coke-oven plants, the comparatively minute crystal produced at such works was the subject of comment in an article appearing in your journal more than thirteen months ago, and, indeed, the reasons underlying the formation of such crystals were discussed in some detail.

In the working of these plants there must either be rock salt (with all its attendant difficulties), with the production of sulphate of ammonia having a reasonable crystal structure for a certain period of manufacture, or there must be an absence of rock salt in the saturators with the production of sulphate of a very fine texture.

Coke-oven managers working semi-direct and direct plants have elected to pursue the latter course as representing the best mode of working when all things are considered. It is doubtful whether the suggestion made, that it is impossible to form large crystals with such plants, is the correct one.

Even if the agitation were of the normal order, with the *higher* acidity obtaining in the saturators at such works, it is quite certain that a small crystal would result. Slow and regulated cooling outside the saturator will not inconceivably give large crystals if the proper conditions are maintained within the saturator.

If the managers of semi-direct and direct coke-oven plants are to produce sulphate of ammonia containing 25·5 per cent. of $NH_3$, they must have recourse to one or other of two processes. Either neutralisation must proceed by the use of a volatile ammonium compound such as has been discussed, or else they must resort to the immersion of their acid-containing salt in a suitable alkaline medium such as is covered by a recently patented process.

There is no necessity for any adverse physiological effects due to washing processes if ordinary precautions are taken. It is quite a simple matter to seal the centrifugal by a light lead cover which is provided with a suction pipe attached to a fan, and to withdraw the pyridine released during neutralisation outside the sphere of operations of the man working the centrifugal. This contrivance can be so counterpoised that it can be readily raised in order to admit of the discharge of the sulphate from the centrifugal basket after the washing and centrifuging processes are completed.

As regards the cordite dryer : the objection to this apparatus is the comparatively large horse-power required to drive the machine, representing, as it does, about 15 h.p. Moreover, this machine is not calculated to give a salt much drier than 0·5 per cent. of moisture, which, according to the standard indicated, can hardly be regarded as a dry sulphate.

The final question raised by your leader as to the advantages and disadvantages of semi-direct and direct processes as affecting the manufacture of sulphate of ammonia in contrast with the liquor distillation process, raises a very large question, concerning which more could be said in a manner befitting the importance of the subject.

## Analytical Control

### Its Importance in the Dyestuffs Industry

On Tuesday, February 27, Dr. Callan, M.Sc., Ph.D., read a paper on "Analytical Control in the Dyestuffs Industry" before the Evening Students' Chemical Society of the College of Technology, Manchester.

Dr. Callan divided the analytical control in the dyestuff industry under five headings, which were as follows : Analytical control of (*a*) the raw chemical materials as brought into the factory ; (*b*) the partly-finished or intermediate products ; (*c*) the raw materials, such as engineering supplies ; (*d*) the finished products ; and (*e*) waste products. Although such a grouping was applicable to practically all chemical factories, some of the smaller ones might not control their affairs to such an extent as set forth ; but in view of the fact that the dyestuff factories were generally conceived on a fairly large scale, the control of each section became of considerable importance. The number of different substances used in a modern dyestuff factory, as raw chemical products, was extraordinarily large, and covered a large range of both inorganic and organic products. In addition to the considerable number bought, a further large number were manufactured as so-called "intermediate products."

Analytical control of these substances, if they were brought into the factory from outside sources, properly commenced in the buying department, and thus prevented the purchasing of substances of an inferior quality. It was far more important that the purchase of an impure or unsuitable product should be prevented rather than it should be discovered when the material actually enters the factory with the subsequent arguments and claims against the seller. A very important part of the analyst's business was to draw up such specifications, and this, of course, can only be done provided he knew exactly what the material was intended to be used for. Furthermore, it was important that the specification should not be unduly strict as otherwise the price of the material might be unnecessarily raised in order that it should pass the specification.

In dealing with methods of analysis, Dr. Callan stated that he would have little to say about inorganic substances, as the methods employed with them followed the lines laid down in all text books on inorganic analysis. The organic substances used in the dyestuff industry were usually "straight" chemical substances, and their determination in many cases was just as straightforward as that of inorganic substances. A very considerable number of organic substances, for example, could be determined by simple volumetric processes. The methods of analyses employed could be divided into two classes, viz. : (*a*) Physical methods ; (*b*) chemical methods, involving the determination of a specific group—e.g., nitro, amido, hydroxy, halogen, etc. These were dealt with in some detail.

In referring to the analytical control of engineering supplies, the lecturer stated that the dyestuff industry was a very large consumer of engineering supplies, and the analytical control of such materials as lead, which is used very largely in chemical plants, fuels, water supplies and water-softening plants, was of considerable importance.

The finished product of a dyestuff factory was, of course, chiefly colour, but many colour factories produced certain intermediates in excess of their own requirements, and these when sold required the same analytical control as a bought product. In addition certain substances—such as betanapthol, paranitraniline, etc.—were sold directly for dyeing purposes although themselves not dyestuffs. In the case of dyestuffs, chemical analysis was rarely used as a method of standardisation, an actual dye trial being generally preferred, the advantage of this being, of course, that not only strength but also shade was determined at the same time. Even for dyestuffs for which exact methods of analysis were available—e.g., methylene blue, indigo and many azo dyestuffs—the chemical standardisation was rarely demanded.

Certain dyestuffs, however, were sold primarily for colouring foodstuffs, and these were always subjected to very strict analytical control to ensure purity and the absence of such poisonous metals as arsenic and lead. These two substances were invariably present in ordinary commercial dyestuffs, so that colours intended for foodstuffs had consequently to undergo a careful purification treatment, and strict analytical control was therefore necessary at every stage.

# Progress and Prospects of the Dyestuffs Industry

## Position Reviewed by Dr. Levinstein

At the annual meeting of the Association of Technical Institutions, at the Carpenters' Hall, London, on Saturday, March 3, Dr. Levinstein gave an important paper on "The Dyeing Industry, Research Work and Higher Education." Owing to shortage of time the paper was taken as read, Dr. Levinstein confining himself to a few remarks, but portions of the paper are of such value that they are given *in extenso*. He explained that his connection with technical education was an old one, as his father was largely instrumental, with Sir James Hoy and Mr. Reynolds, in planning the Technical School, now the Municipal School of Technology, in Manchester, and, as regards the Chemical Department and the Dyeing Department, his was largely the creative brain. The present and very able director of the Dyeing Department and the Paper-Making Department at Manchester, Mr. Heubner, too, was, prior to the building of this school, the head of the dyehouse of Levinstein, Ltd.

### The Growth of the Industry

"There were few people," Dr. Levinstein said, "who questioned during the war the urgency and importance of producing within our own shores the commodities required to support so many staple industries. We were at war with Germany, on whom we had been dependent in peace time for 80 per cent. of our requirements. What happened after the war?" he asked." "Were our textile industries left dependent upon Germany? In 1913 the dyestuffs industry in England supplied about 10 per cent. of the British consumption, which amounted in round figures to rather over 20,000 tons. The factories were comparatively small, and the number of chemists proportionately few. By armistice day the two principal companies, already loosely united, employed some 7,000 persons, nearly 300 academically trained chemists—an unheard of number in this country. During the two years following the armistice over 25,000 tons of dyestuffs manufactured by this British company alone went into consumption in Great Britain." The extraordinary prosperity in the textile trade at that period had its aftermath in the slump. But in 1919 the employment provided by these trades and the money brought into this country as payment for exports were factors without which this country would not have readily recovered from the paralysis of war. He did not know the total value of these exports, but the exports of printed and cotton dyed piece goods alone during 1919–20 amounted to £270,000,000 in value. In October, 1920, the British Dyestuffs Corporation (only one of the important dyestuff makers in this country) employed some 8,000 people, with a yearly wage roll of £1,600,000. This company used 4,000 tons of coal per week, 1,000 tons of pyrites, and corresponding quantities of heavy chemicals and raw materials. These figures would be considered large in this country, where we are not so familiar with very large plants, but, of course, they were small compared with the aggregate of the German I.G. Suddenly in October, 1920, the slump fell upon the country. The position was made much worse by four factors. The German production revived, considerable quantities of German dyes were imported as reparations, the Sankey judgment temporarily removed all protection from the home producer, and the rapid external depreciation of the mark temporarily made it difficult to compete with Germany in neutral markets. Stocks fell in value, large sums of money were lost, and the production of British companies fell down almost to pre-war figures. Many people, he said, could not see a likelihood of any repetition of 1914, and they regarded the possibility of all supplies of dyestuffs being cut off from Germany as a fair commercial risk to run, about as great a risk as the risk of America cutting off her supplies of cotton. Was that a correct view? He thought not. The uninterrupted, continuous supply of dyestuffs was too important for our trade, for us voluntarily to rely upon other countries for it, especially on a country so disturbed financially, socially, and politically as Germany.

### The Ruhr

"I cannot imagine," he said, "a more delicate and political situation than that arising out of the French action on the Ruhr. Fortunately, our negotiators were free from anxiety as to the effect of any action taken by the French on the Ruhr might have in restricting or inhibiting a supply of dyestuffs. It seems clear that if our position in the dyestuffs and fine chemical industries to-day were no better than it was in 1914, we should have to consider what would happen to the textile trade of this country *if* the supply of German dyes were cut off in Germany by troubles on the Ruhr. If we do not have to consider this we have a measure of the progress made. I am careful to express no political opinions. I do not wish to be misunderstood. I am making the one comment on the Ruhr situation as it presents itself to me, viz.: That in fact any restrictions in the output of German dyes is a matter of no political importance, whereas had we not established this industry to the extent which we have done, the possible effect of French action on German chemical industry would have been a factor of first-class political importance. I do not say that every dyestuff wanted for every purpose can, to-day, be supplied from British sources, certainly not. I have a great respect for the ability with which the German dye industry is conducted, and the imposing scale on which it works, and it would be a poor compliment to suggest their products would not, if they ceased again to be available, be missed in any way, by any person for any purpose. I do not say that our textile trade would not, to-day, be left in a 'state of peril,' any more than it was in 1918. I say to-day deliberately the future may be different."

He added, however, that the dyestuff and fine chemical industries in this country were by no means assured of a prosperous development. If the factories were allowed to decay, the staffs to be gradually diminished, the capital invested rendered unremunerative, our position would become less strong. At the moment should the occasion arise the factories and organisations created during the war years were a source of strength.

Another reason why the existence of large factories for the manufacture of dyestuffs and fine chemicals was comforting to those who directed our foreign policy was that it would be a diplomatic disadvantage, to put it no higher, if Germany possessed to an extent greatly overweighing all other nations the capacity to produce promptly on a scale sufficient to secure strategic results of proved military value in the field. He felt bound to refer thus briefly to this side of the question, because the facts existed.

### The Dye Industry a Key to Invention

In addition to the above, there was another reason of great importance in favour of a flourishing and progressive dye industry. The dye industry was a key industry to invention. Any firm wishing to become a serious factor in the world's markets for fine chemicals and dyes must employ a number of research chemists.

"Why?" he asked. "Simply because the chief people in the industry—the German I.G.—employ a large and highly competent research staff. Existing products tend towards obsolescence, competition from other makers tends to lower their prices. New demands constantly arise and are satisfied or created by new products, for which high prices can be obtained, owing to their novelty and at first the absence of competition. Clearly the world's trade belongs to those who bring out the new products, not to those who copy them. Equally clearly in the long run that nation will predominate in this industry, which brings out the best and the largest number of new products.

"These research organisations are expensive," he continued. "Why, then, did the Germans start in this race for new products? Were they so fond of chemistry that they could not keep it out of their business? No," he said, "they found this kind of research to be extremely profitable to their shareholders. Consequently, it was developed, and they were able to bring out annually quite a number of new products which, pushed by enterprising salesmen in all markets, home and foreign, gradually became established branches of manufacture in Germany. Research for new products, costing no more than the old, but for which the public will pay a higher price, is intimately wrapped up with

the question of patents. Having discovered a new product, the object of a firm is to secure a monopoly for its sale for as long a period as possible.

"Without the prospect of a monopoly for a term of years and the lure of high profits," he continued, "this kind of work would not be undertaken on a comprehensive scale. This is the reason why, unfortunately, the monopolies granted by the country in the past for this kind of work were granted to German industries and not to our own, and large profits were made out of British patents by the German dyestuff works. A similar research system if sufficiently supported on the commercial and technological side, and directed with sufficient knowledge of the requirements of the industry, and with some imagination, can be made to pay in England just as in Germany, where this combination existed."

After mentioning the work of the Department of Scientific and Industrial Research, he pointed out that there was a radical difference between industrial research carried out by a company and that by a research association or by a department of State. Practically the question of patents is the fundamental distinction. Patents taken out by chemists who receive part of their emoluments from the Department belonged, he understood, to the Government. Patents which may be taken out by a research association would, he presumed, be available for all subscribers, and could not easily become a profitable monopoly for any one member. For this reason it appeared likely that in the future, as in the past, the dyestuffs industries and the allied fine chemical industries would be the main source from which chemical discoveries would be transferred from the laboratory to the factory. The dye industry would remain the key industry to chemical inventions.

### World-wide Industry

"If you agree," he continued, "that the above reasons render the dyestuffs industry of consequence, you will see that running through all is one common factor, which must be realised if the expectations of the State are to be satisfied. What is the common factor? The industry must be big. There must be large factories containing plant capable of producing great quantities of organic chemicals, staffed by an adequate number of experienced and well-trained chemists. But that is not enough. The factories must not only be large, but they must be growing. It is an industry which cannot succeed if it be static. It is an industry which must be ever increasing its plant, ever increasing the number of its chemists, and ever spreading its tentacles wider and deeper into the markets of the world. One cannot seriously contemplate industrial research of this type, which never discovers anything which can be made on the large scale and sold and bring in profits. Yet there are some who regard the dyestuff and fine chemical industries merely as a kind of limited risk insurance against an eventual stoppage of foreign supplies. They admit the necessity for research, but would be content with a dyestuff industry manufacturing a range of dyes fairly adequate to satisfy to a considerable extent the requirements of the country, leaving to the Germans or others the task of supplying the world's markets, and filling in the gaps which, of course, with the spread of inventions, would be ever growing wider. Such an industry, in my judgment, cannot live in the long run. It would not satisfy the military requirements, and would be of little value to the chemical schools of the country and to the more remote but extremely valuable objects we have in mind. For all of these purposes a world-wide business battling for and securing a share of the world's markets is essential."

### Chemists for the Dye Industry

It followed that if the industry was successful, there would be a continual flow of students from the universities and technical schools to the industry. There were two distinct classes of chemical students required: (*a*) for factory and research, (*b*) for the dyehouse and technical sales. He explained that it was customary in aniline dyestuff factories to recruit the chemists for plant supervision from their own research department. The young chemist engaged on leaving the university was first placed in the research department for at least a year before a permanent engagement was made. The training required of a dyestuff works chemists was usually identical, whether he intended to devote himself afterwards purely to research, or, as in the majority of cases, to become actually employed in the factory. It was of the first importance that chemists should have a good general secondary education, and therefore, very little, if any, chemistry at school. If a man was to devote the whole of his life to chemistry surely the proper thing was to train his mind in some other direction during his school days. Nothing cramped originality so much as early specialisation. A well-trained chemist would readily acquire a special knowledge of dyestuffs and dyestuffs chemistry in the factory. Undoubtedly a knowledge of chemical engineering was useful, as good chemical engineers were invaluable in any chemical industry, but in the dyestuff industry, above all, good organic chemists were wanted.

There was also, he said, a considerable demand for another type of chemist, to take up the work of the technical salesman, a person of great importance in the industry. He should, preferably, take a pure or technological science degree followed by a course in dyeing, printing, paper-making, etc., at a technical college. There was a constant demand for such men in a flourishing dyestuffs industry.

### Development of our Chemical Schools

He had suggested that there was an intimate connection between the progress of our scientific industries and of our universities, and we should expect to see during the years which have elapsed since 1914 a corresponding development in the chemical schools of this country. He had looked at the registers and abstracted figures, from which it appeared that the number of students taking a degree in pure science at 17 English and Welsh Universities in 1913–14 was 1,867. In 1921–22 the number was 4,575; in round figures, two and a half times the 1913–14 number. These did not include Cambridge, where the increase was nearly as great. "The growth of the dyestuff industry within this period," he said, "I have already indicated. There has been a similar growth in the fine chemical industry. Statistics obtained by Mr. F. H. Carr, C.B.E., F.I.C., from a few fine chemical manufacturers, and which Mr. Carr has kindly communicated, show that where 100 fine chemicals were made in England in 1913, 1,400 are now being made. For every ton of fine chemicals made here in 1913 exactly 2½ tons are made to-day. By a curious coincidence this ratio is identical with that of the increase in science students taking a degree course."

### Employment of Chemists

The increase in the number of chemical students was partly due to the publicity given in 1914 to the renascent dyestuffs industry, and to the support given by public opinion and by the Press for the first time in our history to those engaged in these industries. A glamour was thrown over the profession of chemistry; a new career appeared to open itself to persons who had never previously dreamed of making their sons into chemists. It was also probable that the grants made by the Department of Scientific and Industrial Research had tended to increase the number of chemists undertaking training. At the same time the Department had done much to increase the possibility of finding employment for chemists. The Department, including its Headquarters Staff, Boards and Committees, Fuel Research Station, and the Research Associations, already employed 78 chemists, none of whom were employed in 1913, at salaries ranging from about £250 to £2,000, the majority between £350 and £700. In other Government Departments, too, there had been a great increase in the number of chemists employed."

"It seems clear," he continued, "that the number of chemical students now being turned out by our universities was in excess of the number which could be absorbed in Government service, in the teaching profession, or in the strictly chemical industry. If our fine chemical industries began to increase their staffs regularly, as in prosperous years they would —and there were signs of this movement commencing— the situation would be improved, but it was to the general trade of the country and not to the specifically chemical industries that we must look to give employment to all those who had taken a chemical degree. We might welcome the influx of students to the science faculties, and to our technical schools, even if only a proportion propose ultimately to become professional men of science. If we leaven the Civil Service, the political and the business world with an influx of men, scientifically trained, he thought it would be, in the long run, to the national advantage."

# Annual Meeting of the Institute of Chemistry

## The President's Address

*At the 45th annual general meeting of the Institute of Chemistry held at 30, Russell Square, London, on March 1, the President, Mr. A. Chaston Chapman, F.R.S., in presenting the report of the Council, remarked on the progress of the organisation of the profession of chemistry under the Institute. The roll of Fellows and Associates had increased during the past twelve months by 421 to a total of 4,062, and the register of Students by 72 to a total of 955.*

In his address, Mr. Chaston Chapman said the Institute was taking an increasing part in the affairs of the country, and was frequently appealed to by Government Departments and other authorities for advice and help. Natural science —and in this connection chemistry must be given a position of great prominence—was by far the most important dynamic factor in human progress. Notwithstanding its liability to abuse, its discoveries had on the balance made enormously for the greater good and greater happiness of the human race. Science was coming into its own and scientific men would be given their proper status and rightful place in the affairs of the country. The Institute in common with other societies and associations was actively promoting a spirit of solidarity and comradeship among all who were concerned with chemistry, with a view to welding the profession into one coherent whole. With the advances which chemistry was making in all directions and with the high degree of specialisation to which they were tending, many societies had come into existence, but the dangers of decentralisation were greatly lessened by the practice of holding joint meetings of the societies.

### Chemistry and the Community

The direct utilisation by the State of the services of the professional chemist was a matter not only of immediate concern to chemists themselves, but was of high importance to the community at large, and in the interests of the country no less than in those of its members, the Institute was bound to do all it could to ensure that the relations between the appointing authorities and those who held official chemical positions were of a satisfactory character. Unfortunately, some public bodies did not appear to be aware of the lengthy and expensive nature of the chemist's training, or of the difficulties and responsibilities connected with his work, and consequently the Institute found, from time to time, that the advertised conditions of certain public bodies were not commensurate with the importance of the services demanded. The mere saving of money was not always identical with true economy, and it was clearly of public importance that men of good general education, of high professional attainments, and of high moral character should be chosen to fill these public positions, while it was obvious that appointing authorities would seriously limit the field for selection, unless the conditions offered were such that men of the right class would be willing to accept.

### Remuneration of Public Analysts

For the appointment of public analyst the remuneration offered was often entirely inadequate and, in some cases, even below that paid before the war, notwithstanding the enormously increased work and responsibility devolving on the shoulders of the public analyst. A statement on the whole subject would shortly be published by the Institute jointly with the Society of Public Analysts. There was a tendency on the part of local authorities to utilise the services of unqualified or imperfectly trained persons for carrying out what were regarded as simply routine processes, a practice against which the Council had felt bound to protest vigorously on the ground that it constituted a serious danger to the community and involved a waste of public money. Even the simplest process required some skill and experience if pitfalls were to be avoided and mistakes obviated which might, in some cases, have serious consequences.

The Institute had also been obliged to complain of the competition of state-aided institutions with private practitioners, and it was a source of gratification that the Ministry of Agriculture and Fisheries had recognised the legitimate grievance of the private practitioner, and had taken steps towards limiting the agricultural work done in the Institutions receiving its grants to that required for strictly educational purposes or necessary to the advisory work of the Institutions.

### State Recognition of Science

The disinterested zeal of the scientific worker was something without parallel in the whole world, but it was not wise for any country to presume too much on this disinterestedness. Science was one of the greatest and freest of all givers, but it had a right to demand that it should receive that recognition and that proper position in the councils of the country to which it was entitled. The indirect effect of proper State treatment was very great. The rulers of Germany knew very well how much science could do to increase the greatness of their country in times of peace and its chance of success in the event of war. Germany had not changed. A leading German industrial chemist had said lately that notwithstanding Germany's position of virtual bankruptcy the State, at the instigation of the commercial committee of the Reichstag, had come to the help of the great chemical and physical societies, particularly to that of the Kaiser Wilhelm Institute, and if the State could not continue financial aid the German people themselves must give their last mark to maintain science.

### Prospects of the Profession

Referring to the prospects of the profession, the President said chemistry had great attractions for most boys, and there were many induced by a liking begotten in the school laboratory to embark upon a profession for which they had perhaps no real aptitude. A chemical career was not a succession of fascinating experiments, but it involved a good deal of hard work of a comparatively unattractive character, made very great demands on its devotees, and called for much self sacrifice on the part of those who adopted it as a profession. He advised parents who consulted him on the matter to put their sons or daughters to some other calling unless they had so strong a love for the subject that the necessary hard work would lose its element of drudgery and the sacrifices would be cheerfully borne. Although the supply of qualified chemists exceeded, for the moment, the demand, he did not think that there was cause for serious alarm. The profession had attracted a larger number of young men during the last four years than in any previous corresponding period, but he was very optimistic in regard to the future of chemistry, and it was a remarkable fact that, notwithstanding the increased output from the colleges and the intense industrial and commercial depression, the new members of the profession were being steadily absorbed. This absorption might be taken as a definite indication that chemistry was more highly valued by the manufacturer than formerly, and as evidence that the leaders of industry and commerce were turning more and more to science to assist them in the solution of their various problems. He did not forget, however, that there was, for the time, a surplus, and he appealed to the members to do all they could to help those who were out of employment to secure appointments.

The report of the Council and financial statements were received and adopted, and the officers, council, and censors for the ensuing year were elected. The Meldola medal was awarded, for the second time, to Dr. Christopher Kelk Ingold.

## The R.A.M. Centenary

*Punch* has taken up the centenary of the Royal Academy of Music, and publishes in the current issue an appeal for a balance of £19,000 required for the provision of a small theatre wherein British opera and drama may be adequately studied and performed. The Royal Academy, the oldest of all the schools devoted to musical education in this country, has hitherto been largely supported by private subscriptions and donations, and this is the first occasion in a career of a hundred years in which the nation at large has been asked to help. Mr. Philip L. Agnew (chairman of *Punch* directors) is chairman of the committee of management, and is working hard to raise the balance required for the theatre during the centenary year.

# Review of British Chemical Progress Since 1914

## Counter-moves to German Enterprise

A JOINT meeting of the Manchester and Liverpool Sections of the Society of Chemical Industry was held at Manchester on Friday, March 2. A luncheon was held at the Queen's Hotel, at which the official guests were Alderman Sir William Kay, (Chairman of the Manchester Corporation Gas Committee), Dr. E. F. Armstrong (President of the Society of Chemical Industry), Mr. E. V. Evans, Dr. Miall, Dr. Longstaff, and Mr. W. J. U. Woolcock. There was a very large attendance of Manchester members, among whom were Dr. E. Ardern (chairman of the Manchester Section), Dr. H. F. Coward, Mr. John Allen, Dr. J. A. R. Henderson, Mr. W. B. Hart, Mr. J. Huebner, Mr. H. Cheetham, Mr. T. R. Wollaston, Dr. T. Callan, Dr. H. Levinstein, and Mr. L. G. Radcliffe. The Liverpool Section representatives included Professor Bannister, Professor Roberts, Dr. Tranton, Dr. E. Thompson, Mr. E. Gabriel Jones, and Dr. Holt. There were over 60 guests. Letters expressing regret for absence were received from the Lord Mayor of Manchester (Councillor W. Cundiff,) Professor Whalley, Professor Smith and Mr. Burton.

Dr. E. Ardern, having extended a hearty welcome to the visitors, Dr. Armstrong proposed the toast of "The Manchester Corporation Gas Committee," to which Alderman Kay responded. Mr. John Allan proposed the toast of "The Liverpool Section and the London visitors," to which Dr. Holt and Mr. E. V. Evans responded.

A visit was then paid to the Bradford Road Gasworks of the Manchester Corporation where over 100 members of both Sections assembled, and, by the courtesy of Mr. A. L. Holton, general manager, opportunity was afforded for a thorough inspection of the plant.

The ordinary meeting was held at the Textile Institute in the evening, Dr. E. Ardern presiding. It was announced that Dr. H. Levinstein would be chairman of the Manchester Section for the two years 1923–1925.

The proceedings were opened with a paper by Mr. L. Guy Radcliffe, in which the history of the Society of Chemical Industry was reviewed from its establishment in 1881, and an interesting account given of the principal figures who look part in the work.

### Progress since 1914

In an address on "The Progress of the Chemical Industry in Great Britain since 1914," Dr. Levinstein said that at the annual general meeting on July 17, 1919, he stated the reasons which rendered the dyestuff industry vital to the nation both in peace and war, and he thought he was right in stating that none of the arguments which he then used had been refuted, but that subsequent events had rather confirmed them.

In regard to heavy chemicals—he did not think it necessary to define his terms—by far the most important development, in his opinion, was the building of a synthetic ammonia plant at Billingham by Brunner, Mond and Co. During the course of the war the Badische Co. built a very large Haber plant at Merzeburg, in the Strassfurt salt area. Salt, ammonia and carbon dioxide were the chief materials required for producing soda by the ammonia soda process. Ammonia came direct from the plant and carbon dioxide was a by-product in the Haber process, so that by erecting a Haber plant on the salt deposits the Badische Co. were, in a way, making a threatening gesture to the British alkali industry. Brunner, Mond and Co., the most powerful British Chemical Company, had undertaken to counter this menace. The Billingham plant was expected to be in full commercial operation during the current year, with results which would compare favourably with the scale upon which the Germans operated. In conjunction with the contact nitric acid plant, the factory, when completed, would go far to diminish our dependence upon Chile saltpetre. The importance of this, of course, in war time was very clear. Germany would have collapsed but for Oppau, and we could not have carried on if there had been a German blockade, or a foreign blockade, cutting off our connection with the Chilean nitrate deposits. But there was far more in the matter than that. We were out to establish a new industry which would employ a large number of men to manufacture an indispensable product hitherto imported, and probably there would be a surplus to export. We had 50 millions of people to feed and supply with raw materials, the greatest problem which had ever faced us. He did not know whether he was fanciful, but to him it seemed as though the real significance of the Haber ammonia synthesis, and the carrying of it out in this country, lay deeper still. This country was impoverished by the war. How could we more wisely seek to rehabilitate our fortunes than by increasing the fertility of the soil, and what shorter road to wealth could chemists show the nation than by compelling the air and the earth to perform greater service in food production? In this sense the Haber process was one of the greatest acheivements of practical science. He hoped that some day they would be able to make liquid fuels by methods which would find employment for the synthetic industries.

### The Alkali Industry

As the Badische Company impinged, by its Merzeburg factory, upon what he might call our alkali territory, so did, before the war, another company, the Griesheim Electron, the pioneers of electrolytic bleach, many years ago impinge on the dyestuff industry in order to find an outlet for their liquid chlorine. He was glad that in the intervening years the United Alkali Co. had followed a similar course, and had developed an organic manufacturing branch which could feed the dyestuffs and allied industries. Twenty years ago, he believed, the United Alkali Co. were already making monochlorbenzene and, he believed, some dinitrochlorbenzene from their own benzol. During the war the dinitrophenol plant increased until their production was about 100 tons a week. This linking of the alkali industry and the practical chemical industries was an event of great importance. Further developments had also taken place. Castner-Kellner made mononitrochlorbenzene to the great benefit of consumers of dyestuffs. One of the great advantages of the British Dyestuffs Industry was that it acted as an outlet for chlorine.

Dr. Levinstein also referred to the recent introduction of the synthetic method for the production of hydrochloric acid, and, on the organic side, to the production of acetyl cellulose. The large works erected at Spondon were very important. They had a large carbide and synthetic acetic acid plant, although, unfortunately, it was not yet in operation. The manufacture of synthetic acetic acid had attained large proportions in Canada. The manufacture of such substances as acetone, acetic acid, acetaldehyde from coal and lime marked a great technical advance, particularly where there was a great scarcity of wood. The manufacture of carbide, acetylene and its derivatives was just the kind of industry the nation required, and which Providence intended us to have when it permitted our forefathers to cut down our forests. One of the effects of the large manufacture of synthetic acetic acid had been the great increase in price of methyl alcohol, and there was urgent need for the development of a new process of making it independently of the distillation of wood. Acetyl cellulose was also interesting, because it was one of the war industries which appeared to be quite important in peace time. He did not know whether viscose came within the range of chemical industries but it undoubtedly required a very large quantity of chemicals. It was probably classed as a textile industry, but the process was undoubtedly discovered by a British chemist, and had been developed both technically and commercially by British brains and British capital.

### Fine Chemicals

Dr. Levinstein then dealt with the enormous range of photographic chemicals now manufactured in this country by such firms as Johnson, of London, Claus and Co., of Manchester, and Messrs. Cook, and instanced remarkable developments made by such old-established firms as Howells, Bright and Wilson, Bush, Burroughs and Wellcome, Kerfoot, Boot's and others. It was rather remarkable, he added, that no real progress seemed to have been made by new firms in regard to the development of the finer chemical industries. Everything appeared to have been done by firms who had established reputations in some particular direction long before the war. The same observation appeared to apply to the dyestuff industry. The younger of the two firms which to-day forms

the British Dyestuffs Corporation is 60 years old. They had an accumulated knowledge and experience of the business as well as on the technical side, and it was from that nucleus that the developments had sprung. This kind of industry could not be created without a core, and that core we have always had.

Referring to the formation of the Association of British Chemical Manufacturers he said that the industry had grown big enough and strong enough to form an Association which was a power in the land. The chemical industry was no longer deaf and certainly was no longer dumb, for the A.B.C.M. could speak with authority for it, and had rendered remarkable service to its members. Another striking development was the formation of the Department for Industrial and Scientific Research. One of the main sections subsidised by the Department was the Fuel Research Board, a body which had done extremely interesting and valuable work. This led him to state the obvious—*i.e.*, that power should be generated at the pit head and that huge quantities of coal should not be conveyed by rail or by road to the mills and workshops of the country.

### Dyestuffs

Dealing with the dyestuffs question Dr. Levinstein said that his own firm sold as much dyestuff in America and the East as they did in England, and he imagined it was much the same with other firms. The country had had a very good range of azo dyes and a good range of sulphur dyes but there were enormous gaps. The reason for these gaps was because it was difficult to introduce new dyes and make any money out of them. The prices which were obtained for British dyestuffs before the war were lower than those of the Germans, not dearer, and if the British dyes had been lower in quality than the German they could not have been sold at all. It was the greater range which created the demand for the German dyes. The main pre-war difficulty in this industry was not on the manufacturing side but on the selling side. Owing to the large quantities which came over from Germany the consumers felt they must keep in touch with the German manufacturers. There was, however, severe cutting between the two great German firms. His own firm had been an object of special dislike to the Germans ever since the Act of 1907, owing to the action taken by his father over the Patent Acts. In former days the German salesman had instructions to undercut any price his firm quoted in any part of the country to any customer, while later on the Germans cut off all orders for intermediates with the idea of punishing them. To-day the conditions of the dyestuff industry in this country were quite different. Eighty per cent. of the dyes used were wholly British made. He did not wish to be understood as expressing any political views whatever, but whatever was happening in the Ruhr, in his opinion, would not throw one single British workman out of employment. They had not the slightest interest in any industry which could only live by protection. The chemical industries could not live on a protected home market. They were industries of world importance. They had created something which might prize open the door of the unknown, and he was satisfied. As parent industries they must regard them hopefully, but it was to the children of those industries they must look for the real benefits from the great industrial effort in applied chemistry which commenced in 1914.

By the motion of Dr. Armstrong, seconded by Mr. Woolcock, a hearty vote of thanks was accorded Dr. Levinstein for his address.

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### Receiver Appointed for Magadi Soda Co.

In the Chancery Division, on Friday, March 2, before Mr. Justice Romer, Mr. Vaisey, on behalf of the Trust Union, Limited, applied for the appointment of a receiver and manager of the Magadi Soda Company, which has a capital of £1,812,500.

Mr. Vaisey stated that the Trust Union, Limited, held £5,000 out of an issue of £500,000 First Debentures in the Magadi Soda Company, and that the principal moneys became due upon a notice by the directors that it was the intention of the company to cease to carry on its business. The company had entered into large contracts which it was necessary to carry out.

Counsel for the Magadi Soda Company and other parties interested consented, and his Lordship appointed Mr. Andrew Wilson Tait, chartered accountant, Basildon House, E.C., receiver and manager.

## Works Chemists & Industrial Poisoning

### Suggested Conference with Works Doctors

An address on "Industrial Poisoning and Works Chemists" was given before the London Section of the Society of Chemical Industry at the Engineers' Club, on Monday, March 5, by Dr. T. M. Legge, H.M. Medical Inspector of Factories. Mr. E. V. Evans presided.

Dr. Legge gave details of many types of industrial poisoning together with statistics of improvement. His object was to enlist the aid of the works chemist in assisting the medical side in improving processes and plant so that many of the precautions now necessary would become unnecessary, and at the same time render the task of the workers more congenial.

In the discussion which followed, Mr. G. Stevenson Taylor (Home Office) said the ignorance of the danger of CO could not be exaggerated, and he drew special attention to the large number of cases of gassing in this connection at blast furnaces, and in connection with producer gas and coal gas. The number of case of CO poisoning reported was appalling, but there were also a large number not reported when the person recovered quickly. Effective ventilation and proper rescue apparatus were required. There was great danger from sulphuretted hydrogen, particularly in connection with tar stills, the trouble here being the failure of operatives to realise the danger of entering the stills until they had been properly disconnected and ventilated. Trouble had also arisen in cases of examination of tanks and drums which had contained benzene and acetone. It was too often a habit to examine these things with lighted candles and explosions had occurred. In the ventilation of factories where dangerous trades were carried on expert advice was necessary.

### The Position of the Works Chemist

Mr. C. A. Klein said that in too many cases the question of poisoning was not the concern of the works chemist. At present this appeared in the wages sheet under the head of compensation, and therefore it was a matter which concerned the works manager. Dust was the main cause of lead poisoning, and knowledge had been instrumental in reducing the number of cases from 400 down to about 50 in three years.

Mr. Finnimore mentioned that few people realised the danger of dimethyl-sulphate, and he once found it being sent out in Winchester quarts without any cautionary label, and even the manufacturer was surprised when he was told it was a dangerous substance.

Dr. Coles (medical officer, Beckton) speaking as one associated with the Gas Light and Coke Co., said that although there was no smell in the case of CO, there was a very distinct taste, or rather sensation at the back of the throat when it was about, and those at work where CO was liable realised it. The great thing was to educate the men and keep them fit. In the case of CO poisoning, his own plan was to inject oxygen hypodermically whilst carrying out artificial respiration and the inhalation of oxygen.

Mr. Potter, also speaking as a works chemist, emphasised the importance of keeping all plant thoroughly clean.

Dr. Paterson said that the question of poisoning in factories was too often in the hands of the ambulance department, and the works chemist was discouraged from taking any interest in it. It would be a great advantage if employers were made to realise what valuable assistance the works chemist could give in this matter.

Mr. Walter F. Reid pointed to the wording of the Explosives Act, which stated that the works should be in charge of a competent chemist, and therefore the works chemist ought to have the fullest authority.

Dr. Legge, in replying, said that he would like to see, arising out of this meeting, a conference between works doctors and works chemists, but unfortunately the works doctor of the kind he meant on large chemical plants was practically non-existent. The works doctor, by his examination of the workers and consultation with the works chemist, could very often lead the way in an improvement of the plant. With respect to a remark that workers neglected baths, he rather sympathised with the worker; the processes and plant should be so clean and perfect as to eliminate the need of baths and the introduction of elaborate precautions.

## Centrifugal Force & Varnish Clarification

(From a Correspondent.)

From the numerous and rapidly increasing uses to which high centrifugal force is nowadays applied in the solution of clarification and separation problems in chemical industries, it is possible to select several in which the centrifuge—or rather the super-centrifuge rotating at phenomenally high speeds — has radically changed the procedure hitherto in vogue by making possible the attainment of substantial economies both in time and money. One of the most striking and important of these applications of the super-centrifuge has been in connection with the clarification of varnish. The results which have already been obtained in this trade have aroused considerable interest among varnish manufacturers, to whom the problems of clarification are continually giving food for thought, as it is by no means the least expensive part of varnish manufacture, to say nothing of the time occupied, which under the older methods in many cases amounts to several months. Any system or process that can be evolved which will minimise losses and generally speed up the final cleaning operation cannot fail to be of considerable value to those interested.

The principle of the application of centrifugal force for the removal of suspended matter from a liquid appeals strongly to those who are daily confronted with problems coming under this category, but, as in the case of any other force, discrimination must be exercised in the manner in which it is applied. Varnish is a fluid of such extreme viscosity, holding suspended matter in a high degree of dispersion (stated by many to be colloidal) that the highest possible centrifugal force is necessary for the complete deposition of the impurities, and it has been found that this can only be accomplished by the application of a force of no less than 16,000 times that of gravity. It has only been in recent years that such an enormous degree of centrifugal force has been available, but the introduction of the Sharples "super-centrifuge," a machine embodying several radical departures in design from the hitherto accepted types of centrifugal machines, has made this force possible. To produce such a force the rotating member of the machine is made to revolve at 17,000 r.p.m. These figures at first sight appear extraordinary, but it is undoubtedly a fact that there are now numbers of these machines in continual use in Great Britain clarifying varnish, enamels and paints, and producing extremely satisfactory results from the point of view of both clarification and economy.

The varnish is supplied to the centrifuge either by gravity from an overhead supply tank, or it can be pumped direct to the machine with a suitable pump of the rotary type from tanks on the ground level. Capacities vary according to the temperature at which it is desired to treat the varnish. If treated cold, say, at a temperature of 15° C., a perfect clarification is possible at capacities ranging from 40 to 60 gallons per hour at a cost of slightly less than ¼d. per gallon treated, which is inclusive of all capital charges, depreciation, labour, power, upkeep, etc.; and if treated hot, say, at a temperature of 75° to 80° C., capacity runs up to 120 to 200 gallons per hour, with a corresponding reduction in cost per gallon, the system, of course, being continuous in all cases. With such a high centrifugal force the use of a filtering medium, such as paper or cloth, is entirely dispensed with, as substances having even a very minute difference in density between the dispersion medium and the continuous phase may be dealt with, since the separating force may be increased in direct proportion to the centrifugal force applied. It will therefore be seen that a considerable variation in densties between the two mediums is brought about when a force of over 16,000 times that of gravity is applied, resulting in an almost instantaneous and absolutely complete deposition of all suspended matter.

One other, and by no means the least important of the many advantages claimed for this process is the very dry condition of the deposited matter (generally known as "foots") after extraction, thereby giving a greater yield of varnish, which is found to be as much as 5 per cent. and even higher. This point alone is worthy of close consideration, as it is claimed that the economy effected in this manner over a period of about one year is more than sufficient to defray the whole cost of the installation of a centrifugal plant. The small amount of ground-space occupied, and the ease of manipulation, are further advantages claimed for the centrifugal process, while it should be noted that only unskilled attention is required. Black varnish and Japans, the filtration of which is particularly troublesome, are most amenable to the centrifugal process.

A good deal of success has also been achieved by the super-centrifuge in treating linseed oil for the rapid removal of mucilage, and producing an excellent oil for varnish making.

Enamels and paints can also be efficiently handled by the centrifugal process, but it is necessary to point out that, as the character of these materials differs from that of varnishes in the fact that they contain pigments, a somewhat lesser centrifugal force than that above-named should be applied, this being provided for in the super-centrifuge by a slower running rotor, which creates centrifugal force sufficient to remove only the undesirable matter without displacing the pigment.

### Chemical Courses for Metallurgists

It is announced in the current number of the *Journal* that the Council of the Institute of Chemistry have had under careful consideration the standard of training in organic chemistry which should be required of candidates for the Associateship of the Institute who have pursued courses leading to the degree of B.Met. or an analogous degree or diploma. The Council are aware of the view that the practice of metallurgical chemistry does not necessitate an advanced knowledge of organic chemistry, but having regard to the fact that all candidates who are examined for the Associateship are required to pass an examination in general chemistry, including organic chemistry, and that the qualification of Associateship of the Institute must be regarded as the hall-mark of a well trained chemist, they have confirmed their decision that metallurgists as such should not be admitted to the Institute unless they have complied with the conditions which the Council deem necessary in order that such candidates may be regarded as chemists as well as metallurgists. The Council will require every such candidate to produce evidence that he has taken courses and passed examinations in organic chemistry (theoretical and practical) up to the standard of a pass degree in chemistry in a recognised university, and, in addition, will require proof of the attainment of a high standard in the metallurgical degree or diploma examination, before considering any such candidate as eligible for admission to the Associateship.

### "Drug and Chemical Markets" Guide Book

In the new Guide Book just issued to subscribers by *Drug and Chemical Markets* is to be found a very complete buyers' directory of manufacturers and merchants of chemicals, dyes, drugs, oils and allied products in the United States of America. The book, which contains nearly 500 pages, consists of two parts, the first of which comprises a directory of firms with addresses and telephone numbers, all firms being arranged in alphabetical order under their respective cities, which are in turn arranged alphabetically under the States in which they are situated. Part II is a directory of products with the names, addresses and telephone numbers of suppliers under each item. With those names are given particulars as to grades, types and sizes of containers and special shipping regulations. At the end of the book is reproduced the complete text of the Tariff Act, 1922, in so far as it covers chemicals, drugs, dyes, essential oils, paints and allied products.

### British Aluminium

The British Aluminium Co., Ltd., 109, Queen Victoria Street, have published a useful handbook, priced at 5s., containing full particulars of bars, slabs, ingots, tubes, etc., made by them, tabulated fully with dimensions, tensile stress and other data. There are also some pages of useful notes on the methods of working aluminium, together with sundry tables and blank pages for memoranda, the whole being produced in the form of a useful pocket book with detachable leaves.

# Improvement in Heat-Resisting Glasses

### Paper by Professor Turner

THE methods which have been adopted for the purpose of improving the heat resistance of glass, and the avenues of possible future progress, were discussed in a paper by Professor W. E. S. Turner (Head of the Department of Glass Technology, University of Sheffield) before the Royal Society of Arts, London, on Wednesday, February 28. Sir Charles A. Parsons presided.

Professor Turner said that in practice, so far, the attempts which had been made to improve the heat-resisting power of glass had been either in the direction of increasing the mechanical strength or of diminishing the coefficient of expansion. And in this connection the work of Schott and Winkelmann was referred to. These investigators calculated expansion factors which represented the contribution which each one per cent. of a particular oxide made to the total cubical expansion of the glass. During the last four or five years additional research had been carried out in the author's laboratories on the relationship between expansion and composition, and it had been found that some of Winkelmann and Schott's factors needed revision. Two oxides in particular—namely, silica and boric oxide—were associated with small expansion. Although these oxides were used to a considerable extent in modern times, in practice the use of silica and of boric oxide beyond a certain limit was attended by difficulties. In the case of silica the difficulty was merely that of attaining a sufficiently high temperature. Also, whilst sand or powdered silica was cheap, the energy consumed in reaching the necessary temperature for fusion was expensive.

### The Use of Boric Oxide

Boric oxide, on the other hand, and borates in general, fused readily, and the combination of low expansion and ready fusion was a fortunate one. There were, however, drawbacks to the use of boric oxide beyond a certain limit in glass, a large amount of boric oxide diminishing durability of the glass. Whereas the only factor limiting the use of still higher proportions of silica in glass was the design of a very high temperature furnace with refractory materials better than fireclay, the boric oxide, on the other hand, had its limitations, because after a certain concentration was reached the glass became unstable and expansion increased. Nevertheless, by the combination of these two oxides in boro-silicate glasses, big advances in the industrial arts had been made possible, and all the chemical glassware made in this country during the past few years had been of the boro-silicate type.

### Unbreakable Glass

In this connection reference was made to the sensational statements made in the early part of last year in regard to the reported discovery in Czecho-Slovakia of unbreakable glass. Last summer Professor Turner visited the factories where this glass is being developed, and Messrs. Kavalier, the proprietors, gave him clearly to understand that the sensational statements made in regard to the glass had not their approval. Indeed, they showed him that the glass was not unbreakable, although very tough and highly resistant.

### Future Developments

In an endeavour to forecast possible developments, Professor Turner said that the addition of refractory oxides, such as thoria, titania and zirconia was promising, and that preliminary attempts had been made to produce glasses by adding small amounts of titania and zirconia to silica, the objects being to increase the resistance of the fused silica to devitrification and to attack by basic materials. The general results stated to have been achieved were the production of a glass having superior mechanical and thermal properties to vitreosil. At Sheffield it had been found possible to add both zirconia and titania to ordinary glasses, and it was hoped shortly to be able to announce the effect on their properties. It might be noted that, when several per cent. of titania was present, small crucibles of glass could be cooled down without special precautions to yield unbroken lumps. This indicated either a reduced thermal expansion or increased mechanical strength; in any case, an improved heat-resisting glass. Given the requisite optical properties, it is conceivable that the addition of either zirconia or titania to optical glass might make it possible to obtain a bigger yield of glass from an optical glass melting, by reducing the amount of splintering.

# "Stainless Steel"

*To the Editor of* THE CHEMICAL AGE.

SIR,—I note with interest in to-day's issue of THE CHEMICAL AGE a short report of a paper entitled "Stainless Steel," and should like to call attention to what I believe is an incorrect use of the word "stainless" in this connection. I have been given to understand that the appropriate word should be "unstainable," for many steels may be stainless at one time, but by no means unstainable. I think the difference is quite clear. While the delightful controversies of "Benzole *v.* benzol," "What is a fine chemical?" and "What is a chemical engineer?" are still ringing in our ears, it would be a distinct gain if the meaning of a small word could be definitely established, even at the expense of the alliterative effect of the pleasing phrase "stainless steel."—I am, etc.,

Hampstead, March 3. S. C. T.

### Qualifications for True Research

AT a meeting of the Bristol section of the Society of Chemical Industry last week (Mr. M. W. Jones presiding), Dr. Rixon read a paper on "Research." The history of science and historical records, he said, revealed that unless research were undertaken with pure motive it never attained a high level; work undertaken with a view to material advantage was likely to stultify itself and represented considerable energy loss. The researcher must be altruistic, and he must publish his work. A wider scope for publication was desirable; the censoring of publications was not always an advantage, and a journal for the publication of negative experimental work would save much time, and be very valuable. The man who was to make any addition to knowledge must possess insatiable curiosity, persistent energy, willingness to carry out arduous, dangerous, laborious or tedious work; he must be capable of abstract thought along logical lines; yet also capable of imaginative flights transcending those of poetry; physically he should be tough, with the digestion of an ostrich, and endurance of a camel. He should have no anxieties arising from income or domestic problems. Such a man would ultimately have to decide whether he would work alone or with co-workers. The former method, resulting in small bulk of work with high quality, was the typical English one; the latter, resulting in greater quantity with lower general quality, was the German one. Research must not be undertaken for gain. A life of devotion to the discovery of truth resulted in limited fame, and modest competence, but the chief satisfaction should be in the knowledge that work had been well and truly done, and the total of knowledge increased.

### Chemical Engineering Institute Seal

THE following design for an official seal for the Institution of Chemical Engineers has been sketched by Mrs. Hinchley, wife of Professor Hinchley, who has sought to embody the

idea of the Institution as closely as possible. Mr. Cecil Thomas is now working out the sketch in relief for the seal and medal of the Institution.

## The Occupation of the Ruhr

### Effect on Chemical Industry

THE possible effects of the French and Belgian occupation of the Ruhr on the world's chemical and metallurgical industries is explained at some length by *Chemical and Metallurgical Engineering* in its issue of February 21. It is stated that the Ruhr does not contain any workable deposits of iron ore, but rather the abundance of coal has been the factor that has made it the principal seat of Germany's iron and steel industries. According to M. Dariac, a special commissioner of the French Government sent into the Rhineland in advance of the French and Belgian troops, the industries of the territory now occupied employed in 1913 one-fourth of all the factory workers in Germany. This includes 55 per cent. of all workers engaged in mining, 27 per cent. of those in metallurgy, 20 per cent. of the chemical workers and 19 per cent. of those in the textile industries.

Before the war the by-product coke ovens in Germany consumed annually about 45 million tons of coal. Of this amount it was estimated by M. Dariac that 25 million tons came from the Ruhr district. This would account for an output of 400,000 tons of ammonium sulphate and 1,000,000 tons of coal tar. Of this production the Hugo Stinnes group industries accounted for 129,000 tons of coal tar and 69,000 tons of ammonium sulphate.

Practically all of this coal tar passes into consumption in the form of the products of the German organic chemical industries—dyes, pharmaceuticals, colour lakes, perfumes, photographic chemicals, etc. However, these industries for the most part lie outside of the Ruhr district as such, although at least 90 per cent. of them are included within the territory which has been or is now occupied by the Allies. The great plants of the I. G. (Interessen Gemeinschaft) lie to the south of the Ruhr—Badische at Ludwigshaven-on-the-Rhine, Bayer at Leverkusen, Meister Lucius & Brüning at Höchst-on-the-Main, Cassella at Frankfort and Kalle, at Biebrich-on-the-Rhine. Of the less important companies Griesheim-Election is at Offenbach-on-the-Main, Weiler-ter-Meer is at Uerdingen-on-the-Rhine and Leonhardt is at Muhlheim-on-the-Main.

The only important coal-tar dye plant in the immediate vicinity of the Ruhr district is that of Carl Jäger, G.m.b.H., Anilinfarbenfabrik at Düsseldorf. These plants, whether actually within the occupied territory or not, are nevertheless dependent largely on the Ruhr district for their chief raw materials—for coal tar and the so-called crudes form its distillation such as benzol, tuluol, naphthalene, anthracene, carbolic and cresylic acids, etc. Naturally the course of their future production will depend on their supplies of these basic materials. The decreasing coking operations due to labour troubles in the coal mines on the railroads and at the ovens will automatically cut down the supply of raw materials for the dye factories. It has been reported on the authority of high German officials that many of the large dye and chemical factories of Germany now have on hand stocks of crudes and intermediates sufficient to carry them over a period of four to six months.

## List of Scientific Periodicals

AT a recent meeting of the Conjoint Board of Scientific Societies held at the Royal Society, a definite constitution was given to a scheme to prepare and issue a list of all scientific periodicals containing the results of original research, with an indication of the chief libraries in Great Britain where they may be consulted. The Trustees of the British Museum consented to allow the preparation of the list to be undertaken by the staff of the Keeper of Printed Books. Material has been sent in by many scientific societies and libraries. The Carnegie United Kingdom Trust have guaranteed the cost of publication up to £1,000 on condition that libraries at a larger number of centres in Great Britain than was originally intended should be included. Sir Robert Hadfield and Mr. Robert Mond have each given a further guarantee of £250. The Conjoint Board agreed to vest the World List in three permanent trustees—Sir Arthur Schuster, F.R.S., Mr. Robert Mond, and Dr. Chalmers Mitchell, F.R.S.—the trustees to have complete financial control, but to be advised on the general conduct of the scheme by the existing committee.

## Society of Chemical Industry at Glasgow

PROFESSOR J. H. ANDREW, D.Sc., of the Royal Technical College, read a paper on " The Solid State of Matter " before members of the Glasgow Section of the Society of Chemical Industry at a meeting held on Friday in last week at the Engineers' and Shipbuilders' Institute. Dr. Andrew showed how the metallurgist could help the engineer by the study of the physical properties of alloys, in relation to the physical and chemical properties of their constituent elements. It should be possible ultimately to calculate the properties of a variety of steels, for example, from its chemical composition and the conditions of its formation. New theories of atomic structure and of the union of elements by means of their electrons is throwing light upon the nature of the solid state of matter, and particularly on the properties of metallic alloys used in engineering. It was shown, for example, that the whole of the engineering industry, as regards ferrous metals, depends upon the fact that iron exists in two forms according to its temperature, and that the high temperature form of iron dissolves carbon, whilst the low temperature form does not. It was also pointed out that steel containing 13 per cent. of chromium is rustless because the atoms of iron within it are surrounded by atoms of inert chromium, and so protected from atmospheric oxidation. Thus emphasis was laid upon the importance of the study of metallurgy on physico-chemical lines, because in that direction lay the possibility of development in the industrial application of metals.

## Sulphur Dioxide Leaching, Precipitation and Flotation

THE sulphur dioxide leaching programme of the South-west experiment station of the Bureau of Mines, Tucson, Arizona, has been satisfactorily completed. A summary of this work appeared as Serial 2350, Reports of Investigations. The complete article will be issued as Technical Paper 312.

The object of the work now being done is to record all data that may affect the commercial utilisation of a complete recovery process. The leaching of oxide copper is to approximate plant conditions as closely as possible. Precipitation will be by sponge iron manufactured at the South-west station. Flotation for the recovery of cement copper will be by both violent agitation and pneumatic agitation type of cell. The re-use of discard solutions will supply all the ferrous sulphate required and the building up of impurities in the mill solution will be studied for possible adverse results. The plan calls for continuous daily plant operation. Several types of ores will be selected and representative samples carefully prepared such that each day of a particular run will have the same ore condition. Several prominent metallurgists interested in the process have expressed a desire to be present and assist with the run on their ores. The work will be started on complex ore from the Miami Copper Company, which company has detailed an engineer to assist in the run.

## Recent Wills

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| Mr. John Proctor, of Heathcote, Higher Bank Road, Fulwood, near Preston, Lancs., wholesale chemist | £2,370 |
| Mr. Fredeick Henry Smith, of Tyson Road, Forest Hill, and of Messrs. Smith and Tyers, rectifiers and compounders | £16,799 |
| Mr. Ernest Brown, of Cholmeley Park, Highgate, London, N., and of Messrs. Brown and Son, Wedmore Street, Holloway, London | £23,207 |
| Mr. James Cameron-Head, of Inverarlot Castle, Inverness, and Lowndes Square, S.W., a director of the Nitrate Railway Co., Ltd. | £54,820 |
| Professor Alexander Crum Brown, of Belgrave Crescent, Edinburgh, Emeritus Professor of Chemistry at the University of Edinburgh | £8,978 |
| Mr. Arthur le Blanc Newbery, of Elmhurst, Barnet, Herts, senior director of Francis Newbery and Sons, Ltd., druggists' sundriesman, Charterhouse Square, E.C. | £5,188 |
| Mr. Alfred Ernest Hawley, of Leicester Grange, Wolvey, Warwickshire, head of A. E. Hawley and Co., Ltd., of the Sketchley Dye Works, and of Hawley and Johnson, Ltd. | £140,897 |

# Chemical Matters in Parliament

### Plean Colliery Inquiry

Mr. Hardie (House of Commons, March 5) asked the Secretary for Mines if the Government representative at the Plean Colliery inquiry ascertained the temperature at which coal dust was alleged to have coked.

Viscount Wolmer, in reply, said the colliery chemist stated in evidence that he had found by experiment that the temperature at which the coal dust began to coke was 628° Fahr.

### Oxide of Tin

Col. Wedgwood (House of Commons, March 6), asked the Prime Minister what the Rhineland High Commission had decided as to the consignment of oxide of tin bought and paid for by an English firm and held up at Emmerich by the French.

Mr. McNeil replied that His Majesty's High Commissioner at Coblenz had not yet reported with regard to this consignment. The Government were quite aware of the seriousness of the question and it had been doing all it could to accelerate it.

### British Alizarine Company, Ltd.

Mr. T. Thomson (House of Commons, February 26) asked the President of the Board of Trade whether he could state the terms upon which large quantities of alizarine red were handed over to the British Alizarine Co., Ltd., and what proportion of German alizarine was sold for consumption in the United Kingdom and what proportion was exported.

Sir W. Joynson-Hicks replied that alizarine had been handed over to the British Alizarine Co. under an arrangement made between that company and the Government of India, for distribution in that country. No alizarine had been requisitioned for consumption in the United Kingdom.

### Dye Industry

Lieut.-Col. Hilder (House of Commons, March 6), asked the President of the Board of Trade if he had any power to supervise the regulations of the associations of dyers in this country in the event of their enforcing regulations which imposed a handicap on our textile manufacturers; and was he aware that the Bradford Association of Dyers, by insisting that a minimum of six pieces of cloth should be dyed to any one shade, were hindering our manufacturers, since the custom abroad was to allow a minimum of two pieces to any one shade.

Sir P. Lloyd-Greame, in reply, said the answer to the first part of the question was in the negative. The matter appeared to be one for discussion between the interests concerned.

### Metallurgical Coke

Mr. Cyril Lloyd (House of Commons, March 5) asked the Secretary for Mines whether he could give the productive capacity of metallurgical coke in this country in the years 1913, 1920 and 1922, and in the same years the amount consumed in blast furnaces in this country.

Viscount Wolmer replied that he was unable to furnish particulars of the productive capacity of this country in metallurgical coke. The number of coke ovens in use and the quantity of metallurgical coke made in the years specified were:—1913, 21,006 ovens, 12,798,996 tons of coke; 1920, 15,400 ovens, 12,611,435 tons of coke; 1922 (estimated) 10,500 ovens, 9,400,000 tons of coke. The amount of coke consumed in blast furnaces was about 11,750,000 tons in 1913, 10,000,000 tons in 1920, and between 5,750,000 and 6,000,000 tons in 1922.

Mr. Hardie (House of Commons, March 5) asked the President of the Board of Trade what the present supplies of metallurgical coke were in the United Kingdom, and if they were equal to the present demand.

Lieut.-Colonel Lane-Fox replied that he had little doubt that the supply had not yet overtaken the recent sharp increase in demand.

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### Endowment of Technology

Mr. Arthur H. Fleming of Pasadena, California, has made a gift of $4,000,000 to the California Institute of Technology, and recommends that the Institute should specialise in chemistry and physics, under the direction of the most competent men available.

# Manchester Chemical Trade

### Monthly Report by Sir S. W. Royse and Co., Ltd.

In their chemical report dated February 28, Sir S. W. Royse and Co., Ltd. state that during the earlier part of the month business was dull, the improvement noted in January not having been maintained, but latterly there has been a better inquiry, a fair business has been put through and prices generally are firm. Sulphate of copper has been in good request for the home trade, but export demand has been below anticipations, and the Board of Trade returns show that 3,111 tons were shipped last month as against 5,513 tons in January, 1922. Values have changed little, in spite of the big advance and strong position of copper. Green copperas is unchanged. Acetates of lime, and especially grey, continue in short supply and dear, whilst acetic acid is bringing better prices. Acetate of soda has been steadily called for and remains firm. Acetates and nitrate of lead have been selling freely and high figures realised with the advance in lead. A good trade has been passing in litharge and red lead.

Carbonate of potash continues in steady demand and prices are firm. Caustic potash is moving more freely in view of a possible shortage of supply. Yellow prussiates have been irregular; good shipments of potash have recently arrived and pressure to sell has weakened price, but the forward position is firm. Soda also has been selling at low figures, but stocks are not large. White powdered arsenic maintains a strong position, and supplies for near delivery are still scarce and full prices being paid. Tartaric acid has remained steady with fewer offerings of second-hand parcels. Resale lots of cream of tartar continue to depress the market. Some falling away is noticeable in the demand for citric acid, but there is no accumulation of supplies. Tartar emetic has been in strong request for shipment and is rather scarce. Bichromate of potash has been reduced ¼d. per lb. but soda is unchanged. Nitrite and chlorate of soda are firm but lower prices are being accepted for potash. Borax and boracic acid have been in steady request, and phosphate of soda has been moving better. There is no change to report in oxalic acid, whilst trade in alum and sulphate of alumina is well below normal. Muriate of ammonia has been in good request for export, but in lump salammoniac reduced prices have failed to stimulate oversea trade. Bleaching powder and white caustic soda have continued in fair demand for the home trade and the latter has been in active shipment.

There is little change to report in tar products. Benzoles and toluoles are without much inquiry and prices are weak. Business in solvent naphtha is quiet; any orders are keenly competed for and prices show an easier tendency. Creosote maintains its firm tone with little offering. Stocks of crystal carbolic acid have been cleared and export demand continues, famine prices being offered, and crude has advanced considerably. There is more inquiry for naphthalenes, especially crude qualities, and values if anything have improved. Pitch remains in a strong position for this season's shipment and higher prices are reported. Limited inquiries for next season's shipment have been received from the Continent, but consumers are not prepared to accept the discount on present prices offered by makers. South Wales consumers are inactive, being content with their purchases of American pitch, of which, it is stated that large quantities have been secured, and arrival of the first cargo is imminent. Sulphate of ammonia is unchanged.

Dextrine is dearer with less offerings from Holland, due to the destruction by fire of one of the largest works. The call for china clay continues, and there is no change of note to report. Trade in sulphate of barytes has been good and supplies not too plentiful. Paraffin wax and scale are quiet.

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### Dyestuff Licenses

The total number of applications for licences under the Dyestuffs Act, 1920, received during February was 646, of which 514 were from merchants and dealers. To these should be added 56 applications outstanding on February 1, making 702 for the month. These were dealt with as follows: Granted 463, referred to British makers of similar products 121, referred to reparation supplies available 88, outstanding on February 28, 30. Of the total number of applications 553, or 79 per cent., were dealt with within three days of receipt.

# From Week to Week

Mr. A. J. TIBBITT has been appointed managing director of the National Benzol Co.

SIR WILLIAM PEARCE is among the members of the recently revised Advisory Council to the Board of Trade.

A CELLULOSE DIVISION of the American Chemical Society has been inaugurated, and those interested in the chemistry of cellulose from the scientific or the practical standpoint are being enrolled.

EVANS, DAWSON AND CO., iron, steel and general merchants, announce that they have recently commenced business at 13, Bowlalley Lane, Hull, and that they are making a speciality of their chemical and chemical engineering departments, and are in a position to undertake problems in connection with the utilisation of waste products and processes.

At the ANNUAL MEETINGS of the American Chemical Society to be held next month, Professor F. G. Donnan, of University College, London, and Principal J. C. Irvine will be among the British delegates. The subjects for discussion will include motor fuels, the history of coal tar dyes, insecticides and fungicides, and the chemistry of cellulose.

IT IS REPORTED that the British Cyanide Co., Ltd., which has for some years been working on a new process of making cyanide by the fixation of atmospheric nitrogen, during the last few weeks has overcome all technical and engineering difficulties, and that the company is making cyanide under this process more cheaply than by any other known process.

The LEGISLATION between Brunner, Mond and Co. and the Manchester Ship Canal Co. was the subject of further argument in the House of Lords last week, and it was stated that the hearing was expected to occupy the attention of the House, of Lords until the adjournment for the Easter recess. Lord Buckmaster remarked on the prolonged character of the proceedings.

A PAPER on " Reinforced Concrete Construction " was read by Mr. J. H. Nicholson, B.Sc., before members of the Institution of Civil Engineers (Newcastle Association) in the Mining Institute on Monday last. Mr. Nicholson dealt with the subject from the point of view of the contractor rather than of the designer, though the designer was referred to and several diagrams shown and explained illustrating the theory.

THE INSTITUTION OF PETROLEUM TECHNOLOGISTS will hold its tenth annual general meeting at the house of the Royal Society of Arts on Tuesday, March 13, at 5.30 p.m., followed at about 6 p.m. by a presidential address by Professor J. S. S. Brame, F.I.C., F.C.S., the retiring president. The president-elect for the ensuing session is Mr. Herbert Barringer, M.Inst.C.E., M.I.Mech.E., M.I.N.A., and the vice-presidents are Mr. Alfred C. Adams, Sir George Beilby, Sir John Cargill, Viscount Cowdray of Cowdray, Mr. Arthur W. Eastlake, and Sir Thomas H. Holland.

THE CHEMICAL TRADES mail card, just received from Manlove, Alliott and Co., Ltd., engineers, Nottingham, illustrates the excellent use to which such cards can be put by means of a halfpenny post. This particular one has been issued to all the chemical and paint manufacturers throughout the country, and any readers who have not received a copy may obtain one on application to the firm. On the one side of the card (which is about 10 in. by 7½ in.) are illustrations of some of the firm's typical products, and the other is occupied with the address and a concise circular.

A GENERAL MEETING of the members of the Royal Institution was held on Monday, March 5. Sir James Crichton-Browne, treasurer and vice-president, in the chair. The death of Professor Röntgen was reported to the meeting and a resolution of condolence with the family passed. The Countess of Winchelsea, Maharaj Kumar Rajendra Singh of Jhalawar, Dr. Cecil Birt, Miss Elinor Busk, Mrs. A. F. C. Freeman, Mrs. Norah Gribble, Miss M. M. Grimes, Mr. G. P. Moyles, Dr. Nathan Raw, Mrs. J. A. Robinson, Miss T. C. Trench and Mr. A. G. Watkins, were elected members.

THE SECOND of the series of conferences arranged by the Chemical Engineering Group of the Society of Chemical Industry will be held on Monday, March 12, when a paper on " Heat Transference " will be read by Mr. B. Heastie, A.M.I.C.E., at 8 p.m., in the Smoking Room of the Chemical Industry Club. All who are interested in the subject and would like to attend will be cordially welcomed—whether members of the London Section of the Society of Chemical Industry, the Chemical Industry Club or of the Group, or not. The paper should be a particularly interesting one, and prompt attendance is advisable as the accommodation is limited.

THE ROYAL SOCIETY will hold a meeting on Thursday, March 15, at 4.30 p.m., when a paper will be read by Mr. G. C. Steward on " Aberration Diffraction Effects." (Communicated by Professor A. S. Eddington, F.R.S.) Among the papers to be read in title only will be one by Professor J. C. McLennan, F.R.S., and D. S. Ainslie " On the Fluorescence and Channelled Absorption Spectra of Caesium and other Alkali Elements " ; and one by Dr. W. Stiles on " The Indicator Method for the Determination of Coefficients of Diffusion in Gels, with special reference to the Diffusion of Chlorides." (Communicated by W. B. Hardy, Sec. R.S.)

AT THE GENERAL MEETING of Courtaulds, Ltd., on Tuesday, the Chairman (Mr. Samuel Courtauld), in moving the adoption of the report, said that they had been able to sell as much artificial silk as they were able to spin and that the trade in the viscose product during the past year had been very good. The American Viscose Co., in which Courtaulds were large shareholders, had also had a good year and increased their capital. Replying to a question arising out of a rumour that they were about to manufacture artificial cotton, the Chairman said that they were always experimenting in different directions and that he did not think it advisable to indicate these.

THE WELL-KNOWN GERMAN AGRICULTURAL chemist, Dr. Paul Wagner, of Darmstadt, completed his 80th year on March 7, 1923. His friends and students in Germany celebrated in Darmstadt the anniversary of his birthday. It is fifty years ago since Wagner assumed the direction of the Darmstadt Experimental Station, and he has won for this station a world-wide reputation by virtue of his researches in manuring. Wagner (a correspondent writes) has gained special distinction by the fact that, through the aid of pot culture methods worked out by himself, he very materially established and extended the basis for the use of artificial fertilisers. He has been the foremost in his time in recognising and rightly appraising the fertilising value of basic slag. By steady improvement of the methods of carrying out field experiments, he succeeded in making the field experiment a practical means of exact investigation.

THE MANCHESTER BRANCHES of the " Old Finsburians " and the " Old Centralians " held a combined dinner on Friday, February 16, at the Grand Hotel, Manchester, which was attended by about fifty old students. The chair was taken by Mr. A. G. Livesay (local chairman of the Old Finsburians), supported by Dr. E. F. Armstrong, F.R.S. (local chairman of the Old Centralians). Among the speakers were Mr. W. M. Mordey, M.I.C.E. (president of the Old Finsburian Association), Mr. A. C. Cookson, M.I.C.E. (president of the Old Centralians) and Professor W. E. Dalby, F.R.S., Dean of the City and Guilds (Eng.) College. This was the first joint function of the Associations, and in view of its success it was unanimously agreed to hold at least one joint function annually. Old students of either college are requested to get in touch with either Mr. H. F. Coucher (Old Finsburians), 74, Victoria Road, Stretford, Manchester ; or Mr. J. P. Clifton (Old Centralians) Cargill, Springfield Road, Sale.

AT the annual general meeting of the Institute of Metals held in London on Wednesday, March 7, the following officers were elected to serve for the year 1923-24 :—President : Mr. Leonard Sumner, M.Sc. Vice-Presidents : Sir John Dewrance, Mr. W. Murray Morrison, Sir Thomas Rose, Dr. W. Rosenhain, Sir William E. Smith, Professor T. Turner. Honorary Treasurer : A. E. Seaton, London. Members of Council : Mr. W. H. Allen, Bedford ; Mr. L. Archbutt, Derby ; Mr. G. A. Boeddicker, Birmingham ; Mr. T. Bolton, London ; Dr. H. W. Brownsdon, Birmingham ; Engineer Vice-Admiral R. B. Dixon, London ; Professor C. A. Edwards, Swansea ; Mr. S. Evered, Birmingham ; Dr. R. S. Hutton, High Wycombe ; Mr. F. C. A. H. Lantsberry, Sheffield ; Sir Charles A. Parsons, Newcastle-on-Tyne ; Mr. H. A. Ruck-Keene, London ; Dr. R. Seligman, London ; Mr. James Steven, Glasgow ; Mr. F. Tomlinson, Manchester ; Mr. H. B. Weeks, Barrow-in-Furness. Sixty new members were elected, bringing the membership total to 1,458. The next election is due to take place on April 19. Particulars can be obtained from the Secretary, Mr. G. Shaw Scott, M.Sc., 36, Victoria Street, London, S.W.1.

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# Patent Literature

## Abstracts of Complete Specifications

192,426. Reduction of Ore and Production of Gas. J. H. Reid, 35, Congress Street, Boston, Mass., U.S.A. Application date, August 2, 1921.

The process is of the kind in which a mixture of ore, coal, and flux in a finely divided state is subjected to a coking process preparatory to smelting for the reduction to the metal. The object is to make use in this process of certain grades of coal having a sulphur content usually considered too high in such processes. The process is particularly applicable to the reduction of iron ore. The mixture to be coked consists of the following proportions :—iron ore 100 lb., limestone 42 lb., and coal 80 lb. The limestone is ground to a fineness of about 40 mesh, and the coal and iron ore to about 8 mesh. The mixture is charged into a by-product coke oven or other retort, and heated to 2,600°–2,800° F., until the coal is completely coked. All the gases usually obtained by the use of bituminous coal are produced, and the liquid tarry constituents of the coal are cracked in contact with the incandescent finely divided limestone and iron ore. The gases are thus enriched, and the absence of tarry products simplifies the recovery of ammonia from the gas liquor. The retorting process is discontinued before any appreciable conversion of the limestone into lime takes place. This process partly reduces the ore to a lower oxide, and liberates carbon monoxide, and the product which is intimately mixed is then transferred while in a hot condition to the blast furnace, thus effecting a saving of fuel. A quicker fusion and reduction of the ore takes place in the blast furnace and the output is thus increased. The amount of coke necessary is also reduced, since the reduction in the coke oven is effected in the absence of air, and without the production of carbon dioxide. It is found that the sulphur in the coal is absorbed by the lime and not by the iron. Calcium sulphide is formed rather than calcium sulphate, in the reducing atmosphere of the furnace. The large volume of carbon monoxide produced may be mixed with the gases from the coke oven, and the mixed gases may be used for the open hearth furnace. It is found that from the charge mentioned above there is recovered in the coke oven about 600 cubic feet of 500 B.T.U. gas, while the partial reduction of the iron oxide yields about 182 cubic feet of 323 B.T.U. A total of about 358,000 B.T.U. are thus recovered in the coke oven. In the blast furnace about 5,000 cubic feet of gas of 475,000 B.T.U. are recovered, so that the total recovery amounts to about 833,000 B.T.U., or 10,400 B.T.U. for a pound of coal. This represents a recovery of over 70 per cent. of the potential energy of the coal.

192,438. New Ortho–Oxyazo Dyestuffs, Manufacture of. A. G. Bloxam, London. From Akt.-Ges. für Anilin Fabrikation, Berlin, S.O. 36. Application date, September 27, 1921.

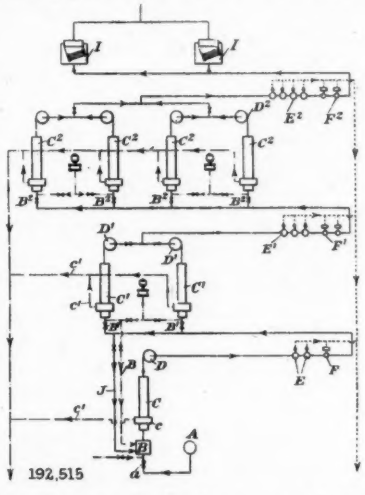
Specification No. 168,681 (*see* The Chemical Age, Vol. V, p. 463) describes the manufacture of new ortho-oxyazo dyestuffs by the combination of a diazotised 2-amino-phenol containing one or more halogen atoms or nitro groups, or both, or homologues of these compounds, and an 8-halogen-1-oxynaphthalene-5-sulphonic acid. It is now found that if the 2-amino-phenol contains 2 halogen atoms and a fifth substituent which may be a halogen atom or alkyl group, and is coupled with an oxynaphthalene sulphonic acid or a substitution derivative, a similar series of dyestuffs is obtained. In an example, 3 : 4 : 6-trichloro-2-amino-1-oxybenzene is diazotised with sodium nitrite and hydrochloric acid, the diazo compound is run into a solution of 1-oxynaphthalene-5-sulphonic acid and sodium carbonate, and the dyestuff salted out. It dyes wool red-brown in an acid bath, becoming reddish blue on treatment with potassium bichromate. The starting material, (3 : 4 : 6-trichloro-2-amino-1-oxybenzene) is produced from 1 : 2 : 4 : 5-tetrachloro-benzene by substituting hydroxyl for chlorine, nitrating, and then reducing. In another example, 3 : 4 : 5-trichlor-aniline is converted into 3 : 4 : 5-trichloro-2-amino-1-oxybenzene by boiling the diazo compound, nitrating and reducing, and this substance is converted into the diazo compound, and is coupled with 1-acetyl-amino-8-oxynaphthalene-4-sulphonic acid in a similar manner. In another example 3 : 4 : 5 : 6-tetrachloro-2-amino-1-oxybenzene is diazotised and combined with 2-oxynaphthalene-6-sulphonic acid. In another example, 4-nitro-1-methylbenzene is dichlorinated, and the nitro-group reduced, yielding 4-amino-2-6-dichloro-1-methylbenzene. The latter is converted into 4-methyl-3-5-dichloro-2-amino-1-oxybenzene by boiling the diazo compound, nitrating and reducing. This compound is diazotised and combined with 1-acetyl-amino 8-oxynaphthalene 4-sulphonic acid, and the dyestuff salted out. Other dyestuffs are produced by the combination of a diazotised dihalogen-2-amino-phenol with one of the following :—1-oxynaphthalene-4-sulphonic acid, 1-amino-8-oxynaphthalene-4-sulphonic acid, 1-amino-8-oxynaphthalene-2 : 4-disulphonic acid, 1-benzoylamino-8-oxynaphthalene-4-sulphonic acid, 1-paratoluene-sulphamino-8-oxynaphthalene-4-sulphonic acid, 1-phenylamino-8-oxynaphthalene-3 : 6-disulphonic acid, 2-benzoylamino-5-oxynaphthalene-7-sulphonic acid.

192,500. Disinfectants, Process for the Manufacture of. J. A. Vielle, 17, Waterloo Place, Pall Mall, London, S.W.1. Application date, November 4, 1921.

The object is to manufacture disinfectants from tar acids, tar oils, and similar substances, by emulsifying them with water in a colloid mill such as described in Specification No. 155,836 (*see* The Chemical Age, Vol. IV, p. 313). The dispersion is assisted by an addition of a very small proportion of soap and free fatty acid. This product has the properties of a colloidal solution, and is miscible in all proportions with water. The product in very dilute solution owing to its high degree of dispersion is a stronger disinfectant than concentrated solutions of the tar acids, etc., as previously produced. A detailed example of the production of a disinfectant from high-boiling cresylic acid is given.

192,515. Distillation or Carbonisation of Carbonaceous Materials. H. Nielsen, 13, Firs Avenue, Muswell Hill, London, and B. Laing, Abdale House, Hatfield, Herts. Application date, November 10, 1921.

The material is distilled in a number of retorts, the first of which is heated by combustion gases from a producer, or from a furnace forming part of the retort. The combustion gases

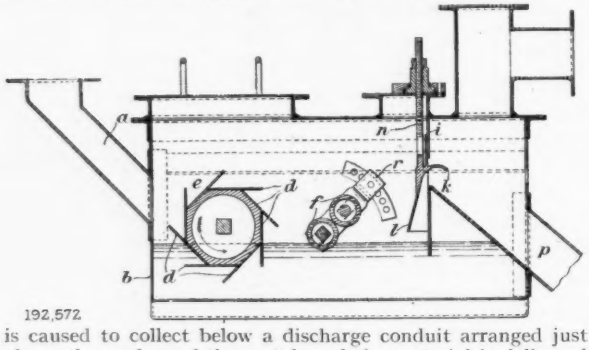



are thus enriched by the distillation gases and, after treatment to remove the oils and tars, are again ignited and admitted to another retort. Gas is supplied from a producer A to a fan *a* and combustion chamber B, where it is burnt. The combustion products pass to a rotary retort C containing the carbonaceous material to be treated, and the coke from this retort is admitted to an annular chamber *c* surrounding the exit end of the retort C, to be cooled. The coke is then discharged to a conveyor $c^1$, and may be partly used in the producer A. The enriched gases pass from the retort to a dust extractor D, condensers E, and oil washers F. The stripped gases are mixed with air, and after burning in combustion chambers $B^1$ are passed into a pair of retorts $C^1$. The

gases from these retorts pass to dust extractors $D^1$, condensers $E^1$, and oil washers $F^1$. The stripped gases pass as before to another series of combustion chambers $B^2$, and retorts $C^2$. The enriched gases from these retorts are similarly treated in dust extractors $D^2$, condensers $E^2$, and oil washers $F^2$. The remaining gases may be used for heating boilers I which supply the steam and power for the plant. After the retorts have been in operation for some time, the producer A may be cut out, and part of the gases passing to the retort $C^1$ may be diverted through a by-pass J to the combustion chamber B, for heating the retort C. It is found that to distil one ton of bituminous slack requires about 800,000 B.T.U., corresponding to the combustion of about 6,000 cubic feet of producer gas. When the combustion gases are used for low temperature distillation it is necessary to reduce their temperature by dilution. The volume of combustion gas employed to distil one ton of coal is about 25,000–35,000 cubic feet, while about 5,500 cubic feet of rich gas of 600 B.T.U. are evolved from the coal. The mixed gas thus possesses a total heating value of about 3,300,000 B.T.U., which is sufficient to distil about four tons of carbonaceous material. The second retort or retorts of the series may thus possess four times the capacity of the first retort, and so on. As an alternative, the fuel in the first retort may be distilled by the sensible heat of the gas from the producer A, and the sensible heat of the combined retort and combustion gases may be made use of at any stage of the process. The distillation of the fuel may be effected either at high or low temperature, or by a combined process.

192,572. Heat Treatment of Substances by Means of Molten Metal, Thermal Industrial and Chemical (T.I.C.) Research Co., Ltd., and J. S. Morgan, 52, Grosvenor Gardens, London, S.W.1. Application date, January 4, 1922.

In the treatment of granular, powdered, fibrous, or other finely divided material in a bath of molten metal, particles of the metal may be discharged with the material. The object is to avoid this contamination with the metal. In the carbonisation of a material such as sawdust, the carbonised product

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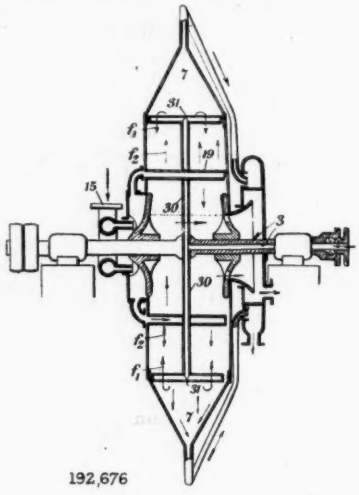
is caused to collect below a discharge conduit arranged just above the surface of the metal, and the material is delivered through the conduit by means of the pressure of the evolved gas, or the steam or other gas which may be supplied for this purpose. The raw material is fed through a shoot *a* to a tank *b* containing molten lead, and is immersed in the lead by the blades *d* of a rotating drum *c*. The material returns to the surface in front of rollers *f* extending across the tank, so that the material is caught up and passes between the rollers, and is thereby crushed. A transverse partition *i* is provided with an opening to receive the curved upper end *k* of a plate *l*, which may be raised and lowered by means of a screwed spindle *n*. The treated material passes under the plate, and is carried upwards by the evolved gases which pass through the same outlet. Any particles of metal fall back into the tank before reaching the curved edge *k*, which diverts the material downwards to the shoot *p*. The rollers *f* are mounted in arms *r* which may be fixed at different angles depending on the size of the material.

192,676. Centrifugal Apparatus for Separating Solids from Liquids. Soc. Générale d'Evaporation Procédés Prache et Bouillon, 25, Rue de la Pépinière, Paris. International Convention date, January 24, 1922. Addition to 190,707.

In a centrifugal separator as described in Specification No. 190,707 (*see* The Chemical Age, Vol. VIII, p. 183), some loss of the clarified liquid may occur owing to its withdrawal with the separated solids, if the proportion of the latter is large. In the present invention this is avoided by the addition of water. The liquid to be treated is supplied through the inlet 15 and then passes through perforated tubes 19 into conical spaces 7 at the periphery of the apparatus. The shaft 3 is made hollow for the admission of water, which passes through radial pipes 30 to distributors 31. The heavier solids tend to move in the direction $f^2$, while the lighter

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water passes in the direction $f^1$ in counter-current. The solids in the cone 7 are thus mixed with water only, so that the separating liquid is recovered without loss.

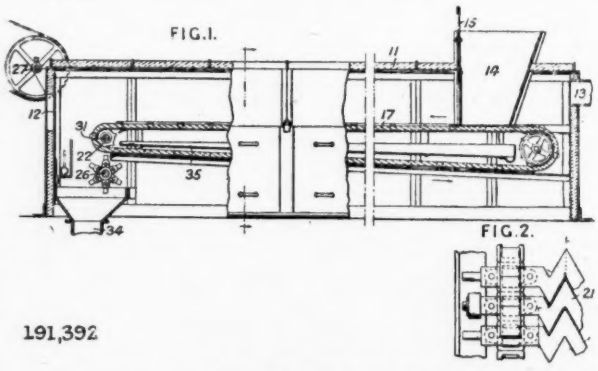
Note.—Abstracts of the following specifications, which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention :—175,989 (P. Andreu and R. Paquet), relating to the fixation of nitrogen, see Vol. VI, p. 602 ; 179,150 (Zellstoff-fabrik Waldhof), relating to regenerating sulphurous acid and waste heat from sulphite cellulose boilers, see Vol. VII, p. 24 ; 188,344 (A. Singer), relating to the manufacture of starch, see Vol. VIII, p. 43.

## International Specifications not yet Accepted

191,357. Obtaining Cellulose from Wood. E. Schmidt, 1, Riehlstrasse, Charlottenburg, Berlin. International Convention date, January 4, 1922.

Wood is treated with chlorine peroxide in a solvent such as dilute acetic acid, and then with alkaline lye.

191,392. Drying Crystals. D. G. Zalocostas, 164, Pitt Street, Sydney, Australia. (Assignee of Sheet Metal Workers, Ltd., Young Street, Waterloo, near Sydney, Australia). International Convention date, January 6, 1922.




191,392

Wet crystals are fed from a hopper 14 to a conveyor belt 17 and are distributed uniformly by a plate 15 having a V-shaped opening in its lower edge. The conveyor is formed of corrugated slats 21, and passes over a driving sprocket wheel 22

which is driven by worm gearing from a shaft 27. The drying chamber is formed of asbestos panels 11, and is provided with inlet and outlet openings 12, 13 for hot air which passes in counter-current over the crystals. The dried crystals are detached from the conveyor by the opening of the slats as they pass over the sprocket wheels 22, aided by a rotary striker 26, and are discharged into the hopper 34. Any liquid detached from the crystals is retained by the tray 35.

191,363. DIOXYPERYLENE. H. Pereira, 6, Frankgasse, Vienna. International Convention date, January 7, 1922.

Dioxydinaphthyl is heated with ring-closing condensing agents, such as aluminium chloride, perferably in the presence of basic substances such as the oxides, hydroxides or carbonates of the alkali and alkaline earth metals, to obtain dioxyperylene.

LATEST NOTIFICATIONS.

193,802. Process for the purifying of hydrocarbons. Allgemeine Ges. Für Chemische Industrie. February 21, 1922.

193,834 and 193,866. Manufacture of azo-dyestuffs. Farbwerke vorm. Meister, Lucius, and Brüning. February 24, 1922.

193,843. Manufacture of highly chlorinated hydro-aromatic products containing nitrogen. Durand et Huguenin Soc. Anon. February 23, 1922.

193,871. Processes and apparatus for the reduction of chemical substances such as alkaline earth sulphates, and more particularly calcium sulphate. Bourdet, A.E.P. February 27, 1922.

## Specifications Accepted, with Date of Application

171,117. Coking retort ovens. J. Becker. November 8, 1920.

176,779 and 181,326. Hydrogen, carbonic oxide, or mixtures of these gases, Process for the manufacture of. Norsk Hydro-Elektrisk Kvaelstof-Aktieselskab. March 9 and June 7, 1921. 181,326 addition to 176,779.

180,625. Hydrocarbons of relatively low boiling point from hydrocarbons of higher boiling point, Production of. M. Melamid. May 25, 1921. Addition to 171,367. Modified by 171,390 and 174,321.

193,071. Lower boiling hydrocarbons from high boiling hydrocarbons, Process of producing. Plauson's (Parent Co.), Ltd. (*H. Plauson.*) August 16, 1921.

193,079. Distilling carbonaceous material, Retorts for. H. E. Lutz. September 12, 1921.

193,081. Crystalline mineral materials, Manufacture of. H Wade. (*Carborundum Co.*) September 19, 1921.

193,188. Lower boiling oils, Manufacture of. R. Haddan. (*Gulf Refining Co.*) December 7, 1921.

193,200. Chlorination of organic compounds. A. Boake, Roberts and Co., Ltd., and O. Silberrad. December 16, 1921.

193,276. Distilling shale and like bituminous fuels, Process for. H. T. P. Gee. (*J. Pintsch Akt.-Ges.*) February 23, 1922.

193,304. Superphosphate, Manufacture of. K. B. Quinan. March 23, 1922.

193,348. Pneumatically conveying granular or bulk material, Method of and apparatus for. H. Klug. August 1, 1922.

193,350. Centrifuges. L. Renault. March 7, 1922.

## Applications for Patents

Amber Size and Chemical Co., Ltd., and Muth, G. Production of aluminium hydroxide and alkali silicates. 5699. February 27.

Ashcroft, E. A. Apparatus for electrolyzing fused salts of metals and recovering metals and acid radicles. 5716. February 27.

Bone, W. A. Production of activated nitrogen. 5849. February 28.

Bourdet, A. E. P. Reduction of calcium sulphate, etc. 5576. February 26. (Belgium, February 27, 1922.)

Dreyfus, H. Treatment of products containing cellulose derivatives. 6204. March 3.

Dutt, E. E. Preparation of manganese dioxide. 5894. March 1.

Farbwerke vorm. Meister, Lucius and Brüning. Manufacture of azo dyestuffs. 5731. February 27. (Germany, April 1, 1922.)

Cruse, H. Manufacture of chemical compounds or salts. 5499. February 26.

Cruse, H. Manufacture of sugar, glycerine, etc., and chemical compounds or salts. 5768. February 28.

Davidson, T. M. Destructive distillation of coal, etc. 5969. March 1.

Harnist, C. Manufacture of fertilizers from sulphur, etc. 5746. February 27. (France, March 1, 1922.)

Heyl, G. E. Distillation of coal, oil shale, etc., for obtaining wax, etc. 6082. March 2.

Holzverkohlungs Industrie Akt.-Ges. Manufacture of hexamethylenetetramine. 5958. March 1. (Germany, March 28, 1922.)

Kestner Evaporator and Engineering Co., Ltd., and Reavell, J. A. Rotary drying-machines. 5838. February 28.

Pinel, A. Ripening alkali cellulose for manufacture of cellulose xanthate. 6015. March 1. (France, March 7, 1922.)

Plauson's (Parent Co.), Ltd., and Plauson, H. Process and furnace for burning lime, etc., and roasting ores. 6051. March 2.

Poma, G. Manufacture of *p*-amino-phenol. 6016. March 1. (Italy, March 9, 1922.)

Royston, G., and Saville, W. Drying sulphate of ammonia, etc. 5877. February 28.

South Metropolitan Gas Co. Electrostatic separation of particles. 6251. March 3.

Spensley, J. W. Treatment of soap stock and production of free fatty acids therefrom. 5532. February 26.

Standard Development Co. and Wade, H. Dehydrating alcohol. 6235. March 3.

Techno-chemical Laboratories, Ltd., and Testrup, N. Evaporation, concentration, drying, etc. 5698. February 27.

## The Properties of Vitamins

AT a meeting recently of the Edinburgh and East of Scotland Section of the Society of Chemical Industry, Dr. G. M. Findlay read a paper on "Vitamins," in the course of which he gave an outline of the properties of the various vitamins and their distribution in foodstuffs. He dealt in detail with the present position of knowledge regarding the relationship of these factors to the development of rickets. It appeared from recent work that cod liver oil which had been deprived of its supply of Vitamin A was yet able to prevent the onset of this disease, so that it had been suggested that there was a fourth vitamin which had been given the name of Vitamin D. Animals fed on a diet deficient in calcium and phosphates and containing as its source of fat some substance like cotton-seed oil would develop rickets, but if to this diet was added a supply of cod liver oil the animal would remain normal. A very interesting fact brought out was that a diet sufficiently deficient in phosphates to produce rickets under normal conditions would not do so if the animal was provided with only starvation quantities of food, or, further, if the animal was exposed to ultra-violet rays. Both starvation and exposure to ultra-violet rays produced an increase in the amount of inorganic phosphate in the blood stream. This was further confirmed by the fact that there was a seasonal variation in the amount of phosphate in the blood of children examined in towns where rickets were prevalent.

## Germany Buying Chilean Nitrate

IN their monthly nitrate report Henry Bath and Son, Ltd., state that the improvement in prices is partly due to the satisfactory progress of February deliveries, but still more to the moral effect of purchases by German consumers, who turned their attention to Chilean nitrate at a moment when, owing chiefly to fluctuations of exchange, it was cheaper than the home-made product.

Following upon earlier advances, and due principally to the heavy increase in the cost of fuel, the Stickstoffsyndikat raised their prices on February 12 to 7,796.80 mks. for sulphate of ammonia and 9,305.40 mks. for nitrate of soda, per unit of nitrogen per 100 kilos. At an exchange of 100,000 mks. per £1 these figures are the equivalent of about £15 17s. and £14 13s. per ton respectively. Subsequently, on February 22, the nitrate price was reduced to 8,710 mks., which, at the same exchange, is equivalent to about £13 14s.; but the price of sulphate, which, in view of its preponderant production, is of much more importance, has not been changed.

A reduction in the output of German nitrogen is regarded as inevitable while the fuel situation in the Ruhr district remains so disturbed. Consequently, there are various reasons for expecting that the recent purchases, which, as yet, may hardly reach 10,000 tons, will be increased.

## Chemical Merchants' Failure

THE affairs of Wulfsberg and Co. (Oluf Christian Wulfsberg and Carl Allen Wilen), trading as chemical merchants and importers, 22, St. Mary Axe, London, came before Mr. Registrar Mellor at the London Bankruptcy Court on Tuesday, on the hearing of an application for an order of discharge by the bankrupt Wilen. The failure occurred in April last, and proofs of debt amounting to £43,052 had been admitted to rank against the joint estate. The assets are expected to realise £2,065, but the trustee anticipates that the dividend will be less than 6d. in the £. The failure is chiefly attributed to moneys received on behalf of the Finnish Government (the petitioning creditors) having been misapplied. The Official Receiver opposed the application alleging fraud. The Registrar in giving judgment decided to substitute the word "misconduct" for "fraud" for the purpose of the application, and suspended the discharge for a period of five years.

# Market Report and Current Prices

***Our Market Report and Current Prices are exclusive to* THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.***

*London, March 8, 1923.*

BUSINESS has been quite active this week, and excitement has been shown in several products. Sellers generally are not too anxious to sell too far forward. In regard to imported products prices on the Continent have now risen to a degree higher than those ruling in this Country, and it is evident that unless these values decline some considerable advances in price will be necessary.

Export demand has been satisfactory, and some substantial contracts have been closed.

## General Chemicals

ACETONE continues firm and active, and for forward business the position is stronger.

ACID ACETIC has again slightly advanced, and stocks are extremely light.

ACID CITRIC is more interesting, and a certain amount of business has been transacted for forward.

ACID FORMIC.—Price is unchanged, and the material is only in moderate demand.

ACID LACTIC is in fair request, and the price is without change.

ACID OXALIC is without change in value and only in moderate request.

ARSENIC is a shade firmer, but it is very difficult to obtain supplies for any near position.

BARIUM CHLORIDE is scarce and firm.

COPPER SULPHATE has been in slightly better request and the price can only be considered as being very cheap in relation to the value of the metal.

FORMALDEHYDE is not very active, but the price is extremely firm.

IRON SULPHATE has been in better request, especially on export account.

LEAD ACETATE is in good request, and the price is a shade higher.

METHYL ALCOHOL is almost unobtainable for near delivery.

POTASSIUM CARBONATE has firmed up.

POTASSIUM CAUSTIC, although only a very small business has been transacted the market has sharply advanced.

POTASSIUM PERMANGANATE has again advanced and is in very short supply.

POTASSIUM PRUSSIATE is active and and the price well maintained.

SODIUM ACETATE is higher in price and is in good demand.

SODIUM BICHROMATE is moderately active at makers' quotations.

SODIUM HYPOSULPHITE is unchanged in value and in good request.

SODIUM NITRITE is firm and inclined to be scarce.

SODIUM PRUSSIATE is slightly more active and more interest is being taken on export account.

SODIUM SULPHIDE is uninteresting and inclined to be easy.

ZINC OXIDE is scarce and firm.

## Pharmaceutical Chemicals

ACETYL SALICYLIC ACID has advanced, manufacturers' output being sold well ahead.

ACID SALICYLIC has advanced again on account of the carbolic situation.

ACID LACTIC 1·21.—The London market is unchanged but firm. Continental manufacturers are therefore asking higher prices for forward delivery.

BARBITONE is firm, supplies on the spot being scarce and difficult to replace.

BROMIDES are steadier. The present prices are unremunerative to Continental makers, many of whom refuse to sell at the old rates.

HEXAMINE is firm and active, higher prices being readily paid.

METHYL SALICYLATE is higher on the week in sympathy with the general advance in salicylate.

PHENACETIN is very firm. Stocks are in strong hands and are being generally held for higher prices.

PHENOLPHTHALEIN is slightly easier on the spot on a slow market.

SODA SALICYLATE is much firmer on the spot. The leading Continental makers have advanced their prices considerably, the effect of which, together with the delay in obtaining delivery of fresh supplies, should be felt here.

## Coal Tar Intermediates

Home trade has been slightly more interesting during the past week, and a fair number of inquiries has also been received in the export market.

ALPHA NAPHTHOL.—Both home and export inquiries; stocks are short.

ALPHA NAPHTHYLAMINE has been chiefly of interest on export account, and the price is firm.

ANILINE OIL is steady, and the salt has been of interest to foreign buyers.

BENZALDEYDE.—Export inquiries have been received for fair quantities.

BETA NAPHTHOL has been of interest for foreign buyers.

DIMETHYLANILINE is very firm, with stocks short.

DIPHENYLAMINE.—Home inquiries are in the market.

" H " ACID has been a fair business for home account.

NITRO BENZOL.—The usual regular orders have been received.

PARANITRANILINE.—Export and home orders are in the market.

PARAPHENYLENEDIAMINE is considerably firmer.

" R " SALT.—Home business has been placed.

RESORCIN.—Some home inquiry.

## Coal Tar Products

The market generally in coal tar products maintains a steady tone, and prices are very firm, except for benzol and solvent naphtha.

90% BENZOL is plentiful, and is worth about 1s. 6½d. per gallon on rails.

PURE BENZOL is also easy, and is worth about 1s. 11d. per gallon in the North, and 2s. 1d. per gallon in the South.

CREOSOTE OIL maintains a firm tone, and is worth about 8¾d. per gallon on rails in the Midlands and North, and 9¼d. to 9½d. per gallon in the South.

CRESYLIC ACID is steady at about 2s. per gallon for the pale quality, 97/99%; while the dark quality, 95/97%, is worth about 1s. 10d. per gallon on rails.

SOLVENT NAPHTHA is weak, and can be bought at 1s. 5d. per gallon on rails in the North, the price in London being about 1s. 9d. to 1s. 10d. per gallon.

HEAVY NAPHTHA is unchanged, at 1s. 6d. per gallon.

NAPHTHALENES are in good demand, and supplies are difficult to obtain for the near position. The lower melting points are worth £8 to £9 per ton, whereas hot pressed is worth about £12 per ton.

PITCH remains very firm and prices are still advancing. To-day's values are 185s., f.o.b. London; 182s. 6d. f.o.b. East Coast; 180s. to 182s. 6d. f.o.b. West Coast.

## Sulphate of Ammonia

SULPHATE OF AMMONIA remains in good demand.

# Current Prices

## General Chemicals

| | Per | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| **Acetic anhydride** | lb. | 0 | 1 | 6 | to | 0 | 1 | 8 |
| **Acetone oil** | ton | 90 | 0 | 0 | to | 95 | 0 | 0 |
| **Acetone, pure** | ton | 130 | 0 | 0 | to | 135 | 0 | 0 |
| **Acid, Acetic, glacial, 99–100%** | ton | 69 | 0 | 0 | to | 70 | 0 | 0 |
| **Acetic, 80% pure** | ton | 45 | 0 | 0 | to | 46 | 0 | 0 |
| Acetic, 40% pure | ton | 22 | 10 | 0 | to | 23 | 0 | 0 |
| **Arsenic, liquid, 2000 s.g.** | ton | 100 | 0 | 0 | to | 105 | 0 | 0 |
| **Boric, cryst.** | ton | 55 | 0 | 0 | to | 60 | 0 | 0 |
| **Carbolic, cryst. 39–40%** | lb. | 0 | 1 | 7 | to | 0 | 1 | 8 |
| **Citric** | lb. | 0 | 1 | 9 | to | 0 | 1 | 10 |
| **Formic, 80%** | ton | 50 | 0 | 0 | to | 51 | 0 | 0 |
| **Hydrofluoric** | lb. | 0 | 0 | 7½ | to | 0 | 0 | 8½ |

| | Per | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| Acid Lactic, 50 vol. | ton | 41 | 0 | 0 | to | 43 | 0 | 0 |
| Lactic, 60 vol. | ton | 43 | 0 | 0 | to | 44 | 0 | 0 |
| Nitric, 80 Tw. | ton | 27 | 0 | 0 | to | 28 | 0 | 0 |
| Oxalic | lb. | 0 | 0 | 6¾ | to | 0 | 0 | 7 |
| Phosphoric, 1.5 | ton | 40 | 0 | 0 | to | 42 | 0 | 0 |
| Pyrogallic, cryst. | lb. | 0 | 5 | 9 | to | 0 | 6 | 0 |
| Salicylic, Technical | lb. | 0 | 1 | 9 | to | 0 | 2 | 0 |
| Sulphuric, 92–93% | ton | 6 | 0 | 0 | to | 7 | 0 | 0 |
| Tannic, commercial | lb. | 0 | 2 | 3 | to | 0 | 2 | 9 |
| Tartaric | lb. | 0 | 1 | 2½ | to | 0 | 1 | 3 |
| Alum, lump | ton | 12 | 10 | 0 | to | 13 | 0 | 0 |
| Alum, chrome | ton | 28 | 0 | 0 | to | 29 | 0 | 0 |
| Alumino ferric | ton | 9 | 0 | 0 | to | 9 | 5 | 0 |
| Aluminium, sulphate, 14–15% | ton | 7 | 10 | 0 | to | 8 | 0 | 0 |
| Aluminium, sulphate, 17–18% | ton | 9 | 10 | 0 | to | 10 | 0 | 0 |
| Ammonia, anhydrous | lb. | 0 | 1 | 6 | to | 0 | 1 | 8 |
| Ammonia, .880 | ton | 32 | 0 | 0 | to | 34 | 0 | 0 |
| Ammonia, .920 | ton | 22 | 0 | 0 | to | 24 | 0 | 0 |
| Ammonia, carbonate | lb. | 0 | 0 | 4 | to | 0 | 0 | 4½ |
| Ammonia, chloride | ton | 50 | 0 | 0 | to | 55 | 0 | 0 |
| Ammonia, muriate (galvanisers) | ton | 35 | 0 | 0 | to | 37 | 10 | 0 |
| Ammonia, nitrate (pure) | ton | 35 | 0 | 0 | to | 40 | 0 | 0 |
| Ammonia, phosphate | ton | 65 | 0 | 0 | to | 68 | 0 | 0 |
| Ammonia, sulphocyanide, com'l, 90% | lb. | 0 | 1 | 1 | to | 0 | 1 | 3 |
| Amyl acetate | ton | 175 | 0 | 0 | to | 185 | 0 | 0 |
| Arsenic, white, powdered | ton | 70 | 0 | 0 | to | 75 | 0 | 0 |
| Barium, carbonate, Witherite | ton | 5 | 0 | 0 | to | 6 | 0 | 0 |
| Barium carbonate, Precip. | ton | 15 | 0 | 0 | to | 16 | 0 | 0 |
| Barium, Chlorate | ton | 65 | 0 | 0 | to | 70 | 0 | 0 |
| Barium Chloride | ton | 17 | 0 | 0 | to | 17 | 10 | 0 |
| Nitrate | ton | 33 | 0 | 0 | to | 35 | 0 | 0 |
| Sulphate, blanc fixe, dry | ton | 20 | 10 | 0 | to | 21 | 0 | 0 |
| Sulphate, blanc fixe, pulp | ton | 10 | 5 | 0 | to | 10 | 10 | 0 |
| Sulphocyanide, 95% | lb. | 0 | 1 | 0 | to | 0 | 1 | 1 |
| Bleaching powder, 35–37% | ton | 10 | 10 | 0 | to | 11 | 0 | 0 |
| Borax crystals | ton | 28 | 0 | 0 | to | 32 | 0 | 0 |
| Calcium acetate, Brown | ton | 11 | 10 | 0 | to | 12 | 0 | 0 |
| ,, ,, Grey | ton | 19 | 15 | 0 | to | 20 | 0 | 0 |
| Calcium Carbide | ton | 16 | 0 | 0 | to | 17 | 0 | 0 |
| Chloride | ton | 6 | 0 | 0 | to | 7 | 0 | 0 |
| Carbon bisulphide | ton | 35 | 0 | 0 | to | 40 | 0 | 0 |
| Casein technical | ton | 98 | 0 | 0 | to | 105 | 0 | 0 |
| Cerium oxalate | lb. | 0 | 3 | 0 | to | 0 | 3 | 6 |
| Chromium acetate | lb. | 0 | 1 | 1 | to | 0 | 1 | 3 |
| Cobalt acetate | lb. | 0 | 6 | 0 | to | 0 | 6 | 6 |
| Oxide, black | lb | 0 | 9 | 6 | to | 0 | 10 | 0 |
| Copper chloride | lb. | 0 | 1 | 2 | to | 0 | 1 | 3 |
| Sulphate | ton | 27 | 0 | 0 | to | 28 | 0 | 0 |
| Cream Tartar, 98–100% | ton | 92 | 10 | 0 | to | 95 | 0 | 0 |
| Epsom salts (*see* Magnesium sulphate) | | | | | | | | |
| Formaldehyde, 40% vol. | ton | 92 | 10 | 0 | to | 95 | 0 | 0 |
| Formusol (Rongalite) | lb. | 0 | 2 | 2 | to | 0 | 2 | 3 |
| Glauber salts, commercial | ton | 5 | 0 | 0 | to | 5 | 10 | 0 |
| Glycerin crude | ton | 65 | 0 | 0 | to | 67 | 10 | 0 |
| Hydrogen peroxide, 12 vols. | gal. | 0 | 2 | 2 | to | 0 | 2 | 3 |
| Iron perchloride | ton | 30 | 0 | 0 | to | 32 | 0 | 0 |
| Iron sulphate (Copperas) | ton | 3 | 10 | 0 | to | 4 | 0 | 0 |
| Lead acetate, white | ton | 42 | 0 | 0 | to | 44 | 0 | 0 |
| Carbonate (White Lead) | ton | 45 | 0 | 0 | to | 48 | 0 | 0 |
| Nitrate | ton | 44 | 10 | 0 | to | 45 | 0 | 0 |
| Litharge | ton | 35 | 10 | 0 | to | 36 | 0 | 0 |
| Lithopone, 30% | ton | 22 | 10 | 0 | to | 23 | 0 | 0 |
| Magnesium chloride | ton | 5 | 10 | 0 | to | 6 | 0 | 0 |
| Carbonate, light | cwt. | 2 | 10 | 0 | to | 2 | 15 | 0 |
| Sulphate (Epsom salts commercial) | ton | 6 | 10 | 0 | to | 7 | 0 | 0 |
| Sulphate (Druggists') | ton | 10 | 0 | 0 | to | 11 | 0 | 0 |
| Manganese Borate, commercial | ton | 65 | 0 | 0 | to | 75 | 0 | 0 |
| Sulphate | ton | 58 | 0 | 0 | to | 60 | 0 | 0 |
| Methyl acetone | ton | 71 | 0 | 0 | to | 75 | 0 | 0 |
| Alcohol, 1% acetone | ton | 105 | 0 | 0 | to | 110 | 0 | 0 |
| Nickel sulphate, single salt | ton | 43 | 0 | 0 | to | 44 | 0 | 0 |
| Ammonium sulphate, double salt | ton | 43 | 0 | 0 | to | 44 | 0 | 0 |
| Potash, Caustic | ton | 33 | 0 | 0 | to | 34 | 0 | 0 |
| Potassium bichromate | lb. | 0 | 0 | 5¾ | to | 0 | 0 | 6 |
| Carbonate, 90% | ton | 31 | 0 | 0 | to | 32 | 0 | 0 |
| Chloride, 80% | ton | 9 | 10 | 0 | to | 10 | 10 | 0 |
| Chlorate | lb. | 0 | 0 | 4½ | to | 0 | 0 | 4½ |
| Metabisulphite, 50–52% | ton | 84 | 0 | 0 | to | 90 | 0 | 0 |
| Nitrate, refined | ton | 43 | 0 | 0 | to | 45 | 0 | 0 |
| Permanganate | lb. | 0 | 0 | 9½ | to | 0 | 0 | 10 |
| Prussiate, red | lb. | 0 | 4 | 3 | to | 0 | 4 | 6 |
| Prussiate, yellow | lb | 0 | 1 | 5½ | to | 0 | 1 | 6 |
| Sulphate, 90% | ton | 12 | 10 | 0 | to | 13 | 10 | 0 |
| Salammoniac, firsts | cwt. | 3 | 3 | 0 | to | | — | |
| Seconds | cwt. | 3 | 0 | 0 | to | | — | |
| Sodium acetate | ton | 24 | 15 | 0 | to | 25 | 0 | 0 |
| Arseniate, 45% | ton | 48 | 0 | 0 | to | 50 | 0 | 0 |
| Bicarbonate | ton | 10 | 10 | 0 | to | 11 | 0 | 0 |
| Bichromate | lb. | 0 | 0 | 4½ | to | 0 | 0 | 4¾ |
| Sodium Bisulphite 60–62% | ton | 21 | 0 | 0 | to | 23 | 0 | 0 |
| Chlorate | lb. | 0 | 0 | 3½ | to | 0 | 0 | 3¾ |
| Caustic, 70% | ton | 19 | 10 | 0 | to | 20 | 0 | 0 |
| Caustic, 76% | ton | 20 | 10 | 0 | to | 21 | 0 | 0 |
| Hydrosulphite, powder | lb. | 0 | 1 | 6 | to | 0 | 1 | 7 |
| Hyposulphite, commercial | ton | 10 | 10 | 0 | to | 11 | 0 | 0 |
| Nitrite, 96–98% | ton | 28 | 0 | 0 | to | 29 | 0 | 0 |
| Phosphate, crystal | ton | 16 | 0 | 0 | to | 16 | 10 | 0 |
| Sodium perborate | lb. | 0 | 0 | 10 | to | 0 | 0 | 10½ |
| Prussiate | lb. | 0 | 0 | 9 | to | 0 | 0 | 9½ |
| Sulphide, crystals | ton | 10 | 10 | 0 | to | 11 | 0 | 0 |
| Sulphide, solid, 60–62% | ton | 16 | 10 | 0 | to | 17 | 10 | 0 |
| Sulphite, cryst. | ton | 12 | 10 | 0 | to | 13 | 0 | 0 |
| Strontium carbonate | ton | 55 | 0 | 0 | to | 60 | 0 | 0 |
| Strontium Nitrate | ton | 40 | 0 | 0 | to | 42 | 0 | 0 |
| Strontium Sulphate, white | ton | 6 | 10 | 0 | to | 7 | 10 | 0 |
| Sulphur chloride | ton | 25 | 0 | 0 | to | 27 | 10 | 0 |
| Sulphur, Flowers | ton | 11 | 10 | 0 | to | 12 | 10 | 0 |
| Roll | ton | 11 | 0 | 0 | to | 12 | 0 | 0 |
| Tartar emetic | lb. | 0 | 1 | 4 | to | 0 | 1 | 5 |
| Tin perchloride, 33% | lb. | 0 | 1 | 2 | to | 0 | 1 | 4 |
| Perchloride, solid | lb. | 0 | 1 | 5 | to | 0 | 1 | 7 |
| Protochloride (tin crystals) | lb. | 0 | 1 | 4 | to | 0 | 1 | 5 |
| Zinc chloride 102° Tw. | ton | 21 | 0 | 0 | to | 22 | 10 | 0 |
| Chloride, solid, 96–98% | ton | 25 | 0 | 0 | to | 30 | 0 | 0 |
| Oxide, 99% | ton | 40 | 0 | 0 | to | 42 | 0 | 0 |
| Dust, 90% | ton | 45 | 0 | 0 | to | 47 | 10 | 0 |
| Sulphate | ton | 16 | 10 | 0 | to | 17 | 10 | 0 |

## Pharmaceutical Chemicals

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Acetyl salicylic acid | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Acetanilid | lb. | 0 | 1 | 4 | to | 0 | 1 | 6 |
| Acid, Gallic, pure | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Lactic, 1.21 | lb. | 0 | 2 | 9 | to | 0 | 3 | 0 |
| Salicylic, B.P. | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| Tannic, leviss | lb. | 0 | 3 | 4 | to | 0 | 3 | 6 |
| Amidol | lb. | 0 | 8 | 6 | to | 0 | 8 | 9 |
| Amidopyrin | lb. | 0 | 13 | 3 | to | 0 | 13 | 9 |
| Ammon ichthosulphonate | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| Barbitone | lb. | 0 | 13 | 6 | to | 0 | 14 | 0 |
| Beta naphthol resublimed | lb. | 0 | 1 | 9 | to | 0 | 2 | 0 |
| Bromide of ammonia | lb. | 0 | 0 | 7½ | to | 0 | 0 | 8 |
| Potash | lb. | 0 | 0 | 6½ | to | 0 | 0 | 7 |
| Soda | lb. | 0 | 0 | 7 | to | 0 | 0 | 7½ |
| Caffeine, pure | lb. | 0 | 12 | 0 | to | 0 | 12 | 3 |
| Calcium glycerophosphate | lb. | 0 | 5 | 9 | to | 0 | 6 | 0 |
| Calcium lactate | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| Calomel | lb. | 0 | 4 | 9 | to | 0 | 5 | 0 |
| Chloral hydrate | lb. | 0 | 4 | 3 | to | 0 | 4 | 6 |
| Cocaine alkaloid | oz. | 0 | 18 | 0 | to | 0 | 18 | 6 |
| Cocain hydrochloride | oz. | 0 | 14 | 9 | to | 0 | 15 | 0 |
| Corrosive sublimate | lb. | 0 | 4 | 3 | to | 0 | 4 | 6 |
| Eucalyptus oil, B.P. (70–75% eucalyptol) | lb. | 0 | 1 | 7 | to | 0 | 1 | 7½ |
| B.P. (75–80% eucalyptol) | lb. | 0 | 1 | 8 | to | 0 | 1 | 8½ |
| Guaiacol carbonate | lb. | 0 | 8 | 3 | to | 0 | 8 | 6 |
| Liquid | lb. | 0 | 9 | 0 | to | 0 | 9 | 6 |
| Pure crystals | lb. | 0 | 10 | 0 | to | 0 | 10 | 6 |
| Hexamine | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| Hydroquinone | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Lanoline anhydrous | lb. | 0 | 0 | 7 | to | 0 | 0 | 7½ |
| Lecithin ex ovo | lb. | 0 | 18 | 6 | to | 1 | 0 | 0 |
| Lithia carbonate | lb. | 0 | 9 | 6 | to | 0 | 10 | 0 |
| Methyl salicylate | lb. | 0 | 2 | 4 | to | 0 | 2 | 9 |
| Metol | lb. | 0 | 9 | 6 | to | 0 | 10 | 0 |
| Milk sugar | cwt. | 4 | 15 | 0 | to | 5 | 0 | 0 |
| Paraldehyde | lb. | 0 | 1 | 5 | to | 0 | 1 | 6 |
| Phenacetin | lb. | 0 | 5 | 3 | to | 0 | 5 | 6 |
| Phenazone | lb. | 0 | 6 | 9 | to | 0 | 7 | 0 |
| Phenolphthalein | lb. | 0 | 4 | 10 | to | 0 | 5 | 0 |
| Potassium sulpho guaiacolate | lb. | 0 | 5 | 0 | to | 0 | 5 | 3 |
| Quinine sulphate, B.P. | oz. | 0 | 2 | 3 | | | — | |
| Resorcine, medicinal | lb. | 0 | 5 | 3 | to | 0 | 5 | 6 |
| Salicylate of soda powder | lb. | 0 | 2 | 4 | to | 0 | 2 | 6 |
| Crystals | lb. | 0 | 2 | 6 | to | 0 | 2 | 9 |
| Salol | lb. | 0 | 2 | 3 | to | 0 | 2 | 6 |
| Soda Benzoate | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| Sulphonal | lb. | 0 | 13 | 6 | to | 0 | 14 | 0 |
| Terpene hydrate | lb. | 0 | 1 | 9 | to | 0 | 2 | 0 |
| Theobromine, pure | lb. | 0 | 12 | 0 | to | 0 | 12 | 6 |
| ,, soda salicylate | lb. | 0 | 8 | 0 | to | 0 | 8 | 6 |
| Vanillin | lb. | 1 | 2 | 6 | to | 1 | 3 | 6 |

## Coal Tar Intermediates, &c.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Alphanaphthol, crude | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| Alphanaphthol, refined | lb. | 0 | 2 | 6 | to | 0 | 2 | 9 |
| Alphanaphthylamine | lb. | 0 | 1 | 6 | to | 0 | 1 | 7 |
| Aniline oil, drums extra | lb. | 0 | 0 | 9½ | to | 0 | 0 | 10¾ |
| Aniline salts | lb. | 0 | 0 | 9½ | to | 0 | 0 | 10¾ |
| Anthracene, 40–50% | unit | 0 | 0 | 8½ | to | 0 | 0 | 9 |
| Benzaldehyde (free of chlorine) | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| Benzidine, base | lb. | 0 | 5 | 0 | to | 0 | 5 | 3 |

| | Per | £ | s. | d. | | £ | s. | d. |
|---|---|---|---|---|---|---|---|---|
| **Benzidine, sulphate** | lb. | 0 | 3 | 9 | to | 0 | 4 | 0 |
| **Benzoic acid** | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| **Benzyl chloride, technical** | lb. | 0 | 2 | 0 | to | 0 | 2 | 3 |
| **Betanaphthol** | lb. | 0 | 1 | 1 | to | 0 | 1 | 2 |
| **Betanaphthylamine, technical** | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| **Croceine Acid, 100% basis** | lb. | 0 | 3 | 3 | to | 0 | 3 | 6 |
| **Dichlorbenzol** | lb. | 0 | 0 | 9 | to | 0 | 0 | 10 |
| **Diethylaniline** | lb. | 0 | 4 | 6 | to | 0 | 4 | 9 |
| **Dinitrobenzol** | lb. | 0 | 1 | 1 | to | 0 | 1 | 2 |
| **Dinitrochlorbenzol** | lb. | 0 | 0 | 11 | to | 0 | 1 | 0 |
| **Dinitronaphthalene** | lb. | 0 | 1 | 4 | to | 0 | 1 | 5 |
| **Dinitrotoluol** | lb. | 0 | 1 | 4 | to | 0 | 1 | 5 |
| **Dinitrophenol** | lb. | 0 | 1 | 7 | to | 0 | 1 | 9 |
| **Dimethylaniline** | lb. | 0 | 3 | 0 | to | 0 | 3 | 3 |
| **Diphenylamine** | lb. | 0 | 3 | 9 | to | 0 | 4 | 0 |
| **H-Acid** | lb. | 0 | 5 | 0 | to | 0 | 5 | 3 |
| **Metaphenylenediamine** | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| **Monochlorbenzol** | lb. | 0 | 0 | 10 | to | 0 | 1 | 0 |
| **Metanilic Acid** | lb. | 0 | 5 | 9 | to | 0 | 6 | 0 |
| **Metatoluylenediamine** | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| **Monosulphonic Acid (2.7)** | lb. | 0 | 5 | 6 | to | 0 | 6 | 0 |
| **Naphthionic acid, crude** | lb. | 0 | 2 | 3 | to | 0 | 2 | 6 |
| **Naphthionate of Soda** | lb. | 0 | 2 | 6 | to | 0 | 2 | 9 |
| **Naphthylamin-di-sulphonic-acid** | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| **Neville Winther Acid** | lb. | 0 | 7 | 3 | to | 0 | 7 | 9 |
| **Nitrobenzol** | lb. | 0 | 0 | 8 | to | 0 | 0 | 8 |
| **Nitronaphthalene** | lb. | 0 | 1 | 0 | to | 0 | 1 | 1 |
| **Nitrotoluol** | lb. | 0 | 0 | 8 | to | 0 | 0 | 9 |
| **Orthoamidophenol, base** | lb. | 0 | 12 | 0 | to | 0 | 12 | 6 |
| **Orthodichlorbenzol** | lb. | 0 | 1 | 0 | to | 0 | 1 | 1 |
| **Orthotoluidine** | lb. | 0 | 0 | 10 | to | 0 | 0 | 11 |
| **Orthonitrotoluol** | lb. | 0 | 0 | 3 | to | 0 | 0 | 4 |
| **Para-amidophenol, base** | lb. | 0 | 8 | 6 | to | 0 | 9 | 0 |
| **Para-amidophenol, hydrochlor** | lb. | 0 | 7 | 6 | to | 0 | 8 | 0 |
| **Paradichlorbenzol** | lb. | 0 | 0 | 6 | to | 0 | 0 | 7 |
| **Paranitraniline** | lb. | 0 | 2 | 7 | to | 0 | 2 | 9 |
| **Paranitrophenol** | lb. | 0 | 2 | 3 | to | 0 | 2 | 6 |
| **Paranitrotoluol** | lb. | 0 | 2 | 9 | to | 0 | 3 | 0 |
| **Paraphenylenediamine, distilled** | lb. | 0 | 12 | 0 | to | 0 | 12 | 6 |
| **Paratoluidine** | lb. | 0 | 5 | 9 | to | 0 | 6 | 3 |
| **Phthalic anhydride** | lb. | 0 | 2 | 6 | to | 0 | 2 | 9 |
| **Resorcin, technical** | lb. | 0 | 4 | 0 | to | 0 | 4 | 3 |
| **Sulphanilic acid, crude** | lb. | 0 | 0 | 10 | to | 0 | 0 | 11 |
| **Tolidine, base** | lb. | 0 | 7 | 3 | to | 0 | 7 | 9 |
| **Tolidine, mixture** | lb. | 0 | 2 | 6 | to | 0 | 2 | 9 |

## Essential Oils and Synthetics

| Essential Oils. | | £ | s. | d. |
|---|---|---|---|---|
| Anise | c.i.f. 1/10 spot | 0 | 2 | 0 |
| Bay | | 0 | 11 | 0 |
| Bergamot | | 0 | 12 | 0 |
| Cajuput | | 0 | 3 | 9 |
| Camphor, white | per cwt. | 4 | 0 | 0 |
| Camphor, brown | scarce „ | 3 | 15 | 0 |
| Cassia | c.i.f. 7/6 spot | 0 | 8 | 3 |
| Cedarwood | | 0 | 1 | 6 |
| Citronella (Ceylon) | easily, forward offered at 2/11 | 0 | 3 | 0 |
| Citronella (Java) | very firm „ „ 3/9 | 0 | 3 | 7 |
| Clove | | 0 | 7 | 6 |
| Eucalyptus | | 0 | 1 | 6 |
| Geranium Bourbon | very firm | 1 | 7 | 0 |
| Lavender | | 0 | 11 | 0 |
| Lavender spike | easier | 0 | 3 | 0 |
| Lemon | | 0 | 2 | 11 |
| Lemongrass | per oz. | 0 | 0 | 2½ |
| Lime (distilled) | | 0 | 3 | 0 |
| Orange sweet (Sicilian) | firmer | 0 | 9 | 6 |
| Orange sweet (West Indian) | | 0 | 9 | 0 |
| Palmarosa | | 0 | 17 | 6 |
| Peppermint (American) | | 0 | 13 | 0 |
| Mint (dementholised Japanese) | weak | 0 | 6 | 6 |
| Patchouli | | 1 | 12 | 0 |
| Otto of Rose | per oz. | 1 | 4 | 0 |
| Rosemary | | 0 | 1 | 8 |
| Sandalwood | | 1 | 6 | 0 |
| Sassafras | | 0 | 5 | 0 |
| Thyme | according to quality 2/4 to | 0 | 6 | 0 |
| **Synthetics.** | | | | |
| Benzyl acetate | | 0 | 3 | 0 |
| Benzyl benzoate | | 0 | 3 | 0 |
| Citral | | 0 | 10 | 6 |
| Coumarine | | 0 | 12 | 6 |
| Heliotropine | | 0 | 6 | 0 |
| Ionone | | 1 | 7 | 0 |
| Linalyl acetate | | 1 | 2 | 6 |
| Methyl salicylate | very firm | 0 | 2 | 3 |
| Musk xylol | | 0 | 9 | 0 |
| Terpeniol | | 0 | 3 | 0 |

## The Manchester Chemical Market

[From Our Own Correspondent]

*Manchester, March 8, 1923.*

The tone of the chemical market here is brighter, though the actual amount of business being put through is relatively small. As far as the home demand is concerned, the cotton industry is one of the weakest spots, though many of the other large industrial consumers of chemical products are taking fairly good supplies. The overseas section of the trade is in much the same position as during the last few weeks, the Dominions being the chief buyers. Prices of several lines are easier.

### Heavy Chemicals

Caustic soda still meets with a fairly healthy demand, both for home consumption and export, at from £19 per ton for 60 per cent. to £21 10s. for 76-77 per cent. strength. Bleaching powder is also active on home and foreign account at £11 5s. per ton. Soda crystals are only in moderate demand, and prices are easier at £5 5s. per ton delivered. Saltcake meets with rather more inquiry at £4 10s. per ton to home consumers. Sodium sulphide, 60 to 65 per cent. concentrated remains dull at £15 per ton, with crystals still quoted at about £9 10s. Glauber salts are quiet but steady at £4 10s. per ton. Bicarbonate of soda is firm at £10 10s. per ton delivered to home consumers, a moderate demand being met with. Alkali is unchanged at £7 12s. 6d. per ton for 58 per cent. material, the home and foreign demand for this product keeping up. Hyposulphite of soda is a very inactive section, though prices are firm at about £15 5s. per ton for photographic crystals and £10 for commercial. Nitrite of soda is rather quiet and quotations are easier at £27 per ton. Phosphate of soda is also slightly lower at £15 5s. per ton. Chlorate of soda is steady and in fairly good inquiry at 2¾d. to 3d. per lb. Prussiate of soda is firm at last week's lower level of 9¼d. per lb., and only a comparatively small amount of business is being put through. Bichromate of soda is steady at 4½d. per lb. Acetate of soda is firm but quiet at £23 10s. per ton.

Caustic potash is in a very strong position at £30 per ton for 88-90 per cent. Carbonate of potash continues quiet at about £25 per ton for 90 per cent. material. Bichromate of potash is in fairly steady demand at 6d. per lb. Yellow prussiate of potash is a shade easier at 1s. 5½d. per lb., bigger supplies being on offer. Chlorate of potash is only moderately active at 3½d. per lb. Permanganate of potash is firm at 8d. per lb., a fair demand for this material being met with.

Sulphate of copper is still rather quiet at £26 to £26 10s. per ton. Arsenic is very firm at £75 per ton for white powdered, Cornish makes, with a good inquiry for shipment. Commercial Epsom salts are in moderate inquiry at up to £6 10s. per ton for British makes; magnesium sulphate, B.P., is steady at £7 10s. Grey acetate of lime is still scarce and prices firm at about £19 10s. per ton, with brown on offer at £10. Nitrate of lead is quiet but steady at £42 10s. per ton. White sugar of lead is firm at £38 10s. to £39 per ton, with brown quoted at about £38.

### Acids and Tar Products

Tartaric acid is still quiet, but the price remains at 1s. 2d. per lb. Citric acid, B.P. crystals, are a trifle easier at about 1s. 7½d. per lb. Acetic acid meets with only a moderate demand at £66 for glacial and £43 10s. per ton for 80 per cent. technical. Oxalic acid is quiet and unchanged at 6½d. per lb.

Pitch is firmer at between £8 and £8 10s. per ton, f.o.b. Manchester, inquiries for shipment to the Continent keeping up. Carbolic acid crystals are now quoted at 1s. 7d. per lb., the export demand being maintained; 60 per cent. crude is firmer at about 4s. per gallon. Benzole is inactive at 1s. 8d. per gallon. Solvent naphtha quiet but steady at 1s. 9d. per gallon. Creosote oil is in good demand at 8½d. to 9d. per gallon. Refined naphthaline is on offer at £17 per ton, and crude at up to £10, a better inquiry being reported.

### Barimar, Ltd.

To keep pace with the growth of their business, Barimar, Ltd., have moved to larger London premises at 14–18, Lamb's Conduit Street, Theobalds Road, London, W.C.1.

# Scottish Chemical Market

***The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.***

*Glasgow, March 7, 1923.*

DURING the past week business has been a little more brisk, and there has been good inquiry, more especially for export. Prices generally are steady, with Continental quotations still higher than a week ago.

### Industrial Chemicals

ACID ACETIC.—Glacial, 98/100%, £59 to £64 per ton; 80% pure, £44 to £46 per ton; 80% technical, £43 to £45 per ton; c.i.f. U.K. ports. A few spot parcels might be obtained at round about the same figures.

ACID BORACIC.—Crystals or granulated, £55 per ton; powdered, £57 per ton, carriage paid U.K. stations.

ACID CITRIC.—B.P. crystals. Price unchanged. Quoted, 1s. 7d. per lb. spot delivery, 1s. 6d. per lb., forward delivery.

ACID FORMIC, 80%.—Spot lots inclined to be scarce. Price about £56 per ton.

ACID HYDROCHLORIC.—Unchanged at 6s. 6d. per carboy, ex works.

ACID NITRIC, 84°.—£27 10s. per ton, ex station, full truck loads.

ACID OXALIC.—Little inquiry. Quoted 6¾d. per lb., ex store.

ACID SULPHURIC.—144°, £3 15s. per ton; 168°, £7 per ton; ex works, full truck loads.

ACID TARTARIC.—Unchanged at about 1s. 2¼d. per lb., ex store.

ALUM, LUMP POTASH.—Inclined to be higher at £13 per ton, ex store.

ALUMINA, SULPHATE.—14/15°, iron free quality, offered at £7 per ton, ex quay.

AMMONIA, ANHYDROUS.—Unchanged at 1s. 6d. per lb., ex station.

AMMONIA, CARBONATE.—Lump, 4d. per lb.; ground, 4¼d. per lb., delivered

AMMONIA, LIQUID.—880°, 3d. per lb.; 920°, 1¾d. per lb. ex works.

AMMONIA, MURIATE.—Grey galvanisers quality, £31 to £32 per ton, f.o.r. works.

AMMONIA, SULPHATE.—25¼%, £15 10s. per ton; 25¾%, £16 13s. per ton; ex works, March/May delivery.

ARSENIC, WHITE POWDERED.—Moderate inquiry. Now quoted £77 per ton, ex quay, prompt.

BARIUM CHLORIDE.—98/100 per cent., spot lots about £17 per ton. Quoted £15 per ton, c.i.f. U.K.

BARYTES.—Finest English white powdered, £5 5s. per ton, ex works.

BLEACHING POWDER.—Spot lots £11 10s. per ton, ex station. Contracts £1 per ton less.

BORAX.—Crystal or Granulated £28 per ton; Powdered, £29 per ton; carriage paid U.K. stations.

CALCIUM CHLORIDE.—English make, £5 15s. per ton, ex quay or station; Continental, offered at £4 15s. per ton, ex store.

COPPER SULPHATE.—In little demand. Price about £26 per ton, ex quay.

COPPERAS, GREEN.—Price about £2 15s. per ton, f.o.b. U.K. port.

FORMALDEHYDE, 40 per cent.—Offered from Continent at £88 per ton, c.i.f. U.K.

GLAUBER SALTS.—Quoted £4 per ton, ex store.

LEAD, RED.—English make, £43 per ton, carriage paid U.K. stations. Continental material at about £34 10s. per ton, c.i.f. U.K.

LEAD, WHITE.—English make, £54 5s. per ton, carriage paid U.K. stations.

LEAD, ACETATE.—Spot parcels of white crystals at £39 per ton, ex wharf.

MAGNESITE, GROUND CALCINED.—£8 10s. per ton, ex station.

MAGNESIUM CHLORIDE.—Continental prices higher. Now about £2 17s. 6d. per ton, c.i.f. U.K. Spot lots, £4 per ton, ex store

MAGNESIUM SULPHATE (Epsom Salts).—Good export inquiry. B.P. crystals £6 10s. per ton, f.o.b. U.K.

POTASSIUM BICHROMATE.—English make, 5¾d. per lb., delivered.

POTASSIUM CARBONATE, 90/92 per cent.—Continental prices higher and about £28 10s. per ton, c.i.f. U.K. Spot lots still offered at about same figure.

POTASSIUM CAUSTIC, 88/92 per cent.—Also advanced to about £31 per ton, c.i.f. U.K. Spot lots at about same figure.

POTASSIUM CHLORATE.—Unchanged at about 3d. per lb.

POTASSIUM NITRATE (Saltpetre).—Quoted £24 to £25 per ton, ex wharf, prompt.

POTASSIUM PERMANGANATE.—B.P. crystals offered at 9d. per lb. Commercial about 8¼d.

POTASSIUM PRUSSIATE (Yellow).—About 1s. 5¼d. per lb., spot delivery.

POTASSIUM SULPHATE, 90 per cent.—Quoted £12 10s. per ton, ex wharf.

SODIUM ACETATE.—In little demand, quoted £24 per ton, ex store.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station; M.W. quality, £1 10s. per ton, less.

SODIUM BICHROMATE.—Unchanged at 4½d. per lb., delivered.

SODIUM CARBONATE.—Soda Crystals, £5 5s. per ton, ex quay or station; Alkali, 58%, £8 17s. 7d. per ton, ex quay or station.

SODIUM CAUSTIC.—76/77%, £21 10s. per ton; 70/72%, £20 per ton; 60/62%, broken, £21 5s. per ton; 98/99% powdered, £24 17s. 6d. per ton; ex station, spot delivery.

SODIUM CHLORATE.—Offered at 2¾d. per lb., ex store.

SODIUM HYPOSULPHITE.—Commercial, £10 per ton, ex store; pea crystals, £15 10s. per ton, ex station.

SODIUM NITRATE.—Refined 96/98% quality, £13 7s. 6d. per ton, f.o.r. or r.o.b. U.K.

SODIUM PRUSSIATE.—Offered at 8½d. per lb., c.i.f. U.K., prompt shipment. Spot lots, 9d. per lb.

SODIUM SULPHATE (SALTCAKE 95%).—£4 per ton, for home consumption. High prices for export.

SODIUM SULPHIDE.—60/62% solid offered at £14 per ton; 30/32% crystals about £7 10s. per ton, c.i.f. U.K.

SULPHUR.—Government surplus stocks of Sicilian thirds available at £3 10s. to £3 15s. per ton, ex depot; flowers, £10 per ton; roll, £9 per ton; rock, £8 per ton; ground, £8 per ton. Prices nominal.

TIN CRYSTALS.—Unchanged at 1s. 2d. per lb.

ZINC SULPHATE.—Technically pure crystals, £14 10s. per ton, ex station.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

### Coal Tar Intermediates and Wood Distillation Products

ACETYL PARA PHENYLENE DIAMINE.—Price quoted 5s. 3d. per lb. 100% basis carriage paid.

ALPHA NAPTHYLAMINE.—Home inquiry, price quoted 1s. 7½d. per lb., carriage paid.

BENZOIC ACID.—Home inquiry, price 2s. 3d. per lb., delivered.

BENZOL 90s.—Supplies are offered at 1s. 7d. per gallon ex works.

DIPHENYLAMINE.—Several inquiries for export, price 3s. per lb. f.o.b. U.K. port.

DIMETHYLANILINE.—Limited supply, price 3s. per lb., delivered in returnable drums.

"H" ACID.—Extensive inquiry for export, price quoted 5s. per lb., 100% basis f.o.b.

METHYL ALCOHOL.—Is still very scarce. Current offers at £95 per ton c.i.f. Liverpool.

NAPTHALENE POWDER.—Home inquiry, price quoted £16 per ton, delivered.

PARA PHENYLENE DIAMINE.—Export inquiry, price 12s. 6d. per lb., 100% basis f.o.b.

# Company News

JOHN OAKEY AND SONS, LTD.—The net profits for the year is £42,104, which enables the directors, after payment of the preference dividend, to distribute a final dividend at the rate of 7½ per cent., making 10 per cent. for the year.

SALT UNION, LTD.—The directors announce dividends of 2s. 4d. per share on the preference shares and 2s. per share, equal to 10 per cent., on the ordinary shares for the past year, carrying forward £20,228. For the preceding year 1s. per share was paid on the ordinary and £21,500 was carried forward.

LOCKE, BLACKETT AND CO., LTD.—The accounts for 1922 show a profit of £15,781, and £2,423 brought in, making £18,204. The directors have written off £2,000 for depreciation, and have placed a further £5,000 to reserve (making it £40,000), and £1,000 to the suspense account. A dividend of 7 per cent. on the preference stock, and 1s. 6d. per share on the ordinary shares, is to be paid, both less tax, absorbing £7,831, leaving £2,373 to be carried forward. The directors state that a settlement with the Government in respect of excess profit duty and corporation tax has not yet been effected. The annual meeting will be held at the Gallowgate Lead Works, Newcastle-upon-Tyne, on March 12, at 11.30 a.m.

BRITON FERRY CHEMICAL AND MANURE CO., LTD.—A profit of £8,830 is shown in the accounts for the year 1922, after writing off £5,000 for depreciation, £10,400 for debenture interest, and transferring £5,000 to chambers and columns renewal account. The directors recommend the payment of one year's arrears of dividend on the preference shares, less tax, to be paid on March 15, to holders on the books on February 27. After this payment the interest on the preference shares will be one year in arrear. The report states that although operations connected with the manufacture of sulphuric acid have produced satisfactory results during the year, the manufacture of fertilisers has, owing to foreign competition, been unremunerative, and heavy losses in connection with raw material have been sustained. These disadvantages have, to a large extent, been offset by a settlement with the income-tax authorities of questions of liability to excess profits duty, and of allowances for depreciation in respect of plant erected during the war. This settlement has enabled the directors to bring £25,677 to the credit of profit and loss from the income-tax provision account and from refunded income-tax. The directors state that the present demand for acid is good, and prospects for the current year are favourable. The annual meeting will be held at 9, Queen Street Place, E.C., on March 13 at 2.30 p.m.

## Explosibility of Ammonium Nitrate

AT the Pittsburgh experimental station of the United States Bureau of Mines small scale tests of ammonium nitrate are being made to determine its explosibility by means of boosters only. The tests will be made at normal temperature with the ammonium nitrate at normal density and with such a degree of confinement as is found suitable from preliminary tests. The compression of small lead blocks will be used as the criterion of explosibility. The use of the following explosives as boosters is contemplated: Picric acid, tetryl, TNT, TNA, amatol 80/20, high grade ammonium dynamite, blasting gelatin and 40 per cent ammonia dynamite. This work is being done in co-operation with the National Research Council who will direct further work on the problem.

## Tariff Changes

ECUADOR.—The import duties on soap are now considerably reduced. Particulars may be obtained from the Department of Overseas Trade, 35, Old Queen Street, Westminster, S.W.1.

ROUMANIA.—The export of crude petroleum and residues is prohibited, and special authorisation is necessary for the export of copper, caustic soda, paraffin wax, petroleum products and ferromanganese, among other goods.

CHINA.—The Chilean Nitrate Committee are reported to have been officially advised from Pekin that the Maritime Customs authorities have lifted the embargo on the import of nitrate into China.

# Chemical Trade Inquiries

*The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.*

| LOCALITY OF FIRM OR AGENT. | MATERIAL. | REF. NO. |
|---|---|---|
| New Zealand .. | Aniline dyes, sulphur, caustic soda, alkalis, essential oils, soaps, etc. | — |
| South Africa ... | Creosote. | D.O.T.10710/E.D./C.C./2. |
| Amsterdam .... | Chemicals for pharmaceutical purposes. | — |
| Washington ... | Calcium arsenate and white arsenic. | D.O.T.5411/A./T.C./C.C 2. |

## "Chemical Age" Inquiry List

*The following inquiries have been received from readers of "The Chemical Age." Replies addressed to the box number given below, c/o "The Chemical Age," 8, Bouverie Street, London, E.C.4, will be forwarded to the inquirers.*

Manufacturers of assorted bottle cases, corks, and metallic tubes for dental use.—No. H18.

Manufacturers of TNT for mining purposes.—No. H19.

Manufacturers of alum lump, sulphate of copper, pine resin, caustic soda, pitch.—No. H20.

Manufacturers of and dealers in Cerium Di-oxide, Thorium Di-oxide, and Zirconium Oxide.—No. H21.

## Contracts Open

*Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses:*

JOHANNESBURG. (March 13, necessitating cable instructions).—60 tons (each 2,240 lb.) of creosote and/or alternatively 120 tons of creosote. The Department of Overseas Trade will supply to interested United Kingdom firms who are not locally represented, the names of South African firms who may be prepared to handle tenders on their behalf. Specification and conditions of tender on application to the Department of Overseas Trade (Room 53), 35, Old Queen Street, London, S.W.1. Reference No. 10,710/ED./C.C.(2).

SAVANNAH.—Calcium arsenate and white arsenic. Particulars from Department of Overseas Trade, 35, Old Queen Street, London. Reference No. 5411/A/T.C./C.C.(2).

TWICKENHAM (March 20).—Distilled tar. Particulars from F. W. Pearce, Town Hall, Twickenham.

SAN FRANCISCO.—Acetone. Particulars from Department of Overseas Trade (Room 52), 35, Old Queen Street, London. Reference No. 18776/F.W./C.C. (2).

## French Potash

THE market for potash salts shows fair activity. More interest is now being taken in quotations for all grades, and orders for spring requirements are being placed with more freedom than formerly. Kainit and Sylvinites continue to be in greater demand, but abroad sales of muriate and sulphate have brightened up lately. A recommendation for an alteration in the management of the potash mines of Alsace has recently been adopted by the French Chamber. It is anticipated that the proposals will receive final sanction and will be put into operation immediately. The scheme provides for the formation of a large company, 50 per cent. of the shares of which are to be offered to agricultural associations, the remainder in fixed proportion to other organisations interested in potash. Two controllers will be nominated by the Government and a Sales Bureau will market the product.—*Agricultural Information Bureau.*

# THE BRITISH ALIZARINE COMPANY LTD.

**Manchester London Glasgow**

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*BRITALIZ LONDON*
*BRITALIZ GLASGOW*

All communications should be addressed to

The British Alizarine Co., Ltd.

Trafford Park, Manchester

# Commercial Intelligence

*The following are taken from printed reports, but we cannot be responsible for any errors that may occur.*

## County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BRIGGS, Mr. A. F., Drug Stores, 208, St. John's Lane, Bristol, chemist. (C.C., 10/3/23.) £44 18s. 11d. January 22.

CLARENDON CHEMICAL CO., LTD., R/O, Finsbury House, Bloomfield Street, E.C., chemical manufacturers. (C.C., 10/3/23.) £19 11s. 2d. January 11.

HARRISON, Mr. C., 9, Coleherne Terrace, South Kensington, chemist. (C.C., 10/3/23.) £23 1s. 9d. January 12.

McGREGOR, Mr., 12, Market Street, Morecambe, chemist. (C.C., 10/3/23.) £24 1s. 7d. January 22.

PARREN, Mr. P. S., 301, Wandsworth Bridge Road, chemist. (C.C., 10/3/23.) £16 15s. 7d. January 22.

## Receivership

STUCKEY (W. G.) AND CO., LTD. (R., 10/3/23.) W. G. Stuckey, of 125, Woodstock Road, Golder's Green, N.W., was appointed Receiver on February 26, 1923, under powers contained in debentures dated January 26, 1923.

## Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

DEARBORN (1923), LTD., London, W.C., manufacturing chemists. (M., 10/3/23.) Registered February 22, £22,628 2s. 7d. debenture, to S. F. Ely, 132, Auckland Road, South Norwood; general charge.

MULTI-COLOR DYERS (1920), LTD., Trawden. (M., 10/3/23.) Registered February 23, debenture and a mortgage collateral thereto, to bank; general charge and premises, etc., at Trawden. *——. December 31, 1921.

ODCLON (1922), LTD., London, E.C., perfumery manufacturers. (M., 10/3/23.) Registered February 16, £400 debentures dated February 5, 1923; general charge. *£400. February 9, 1923.

TAYLORS' DRUG CO., LTD., Leeds. (M., 10/3/23.) Registered February 22, covenant to surrender and mortgage securing £15,000, to bank; charged on part of Hutchinsons Buildings, High Street, Sunderland. *£74,796 0s. 3d. January 3, 1923.

## London Gazette

### Winding-Up Petition

LANCASHIRE PHOSPHATES, LTD. (W.U.P., 10/3/23.) A petition for winding-up has been presented, and is to be heard at St. George's Hall, Liverpool, on Wednesday, March 14, 1923, at 10.45 a.m.

## New Companies Registered

HENRY BELL, LTD., 62, The Quay, Waterford, chemists and druggists, oil and colourmen, etc. Nominal capital, £15,000 in £1 shares (8,500 preference and 6,500 ordinary).

F. E. BROWN AND CO., LTD., Guthlaxton Street, Leicester, manufacturers of and dealers in photographic materials, scientific and optical instruments, etc. Nominal capital £2,000 in £1 shares (1,200 preferred ordinary shares and 800 deferred ordinary).

FULGO PRESERVATIVE, LTD., Sardinia House, Kingsway, London, W.C., manufacturers of and dealers in preservatives of all kinds, chemicals, drugs, etc. Nominal capital, £1,000 in £1 shares.

SUMTACHE CO., LTD., 2, Cross Street, Dagnal Street, St. Albans. Proprietors and exploiters of "Suntache" and other chemical compounds, etc. Nominal capital, £2,750 in £1 shares.

WATSON FAIRBAIRN CHEMICAL CO., LTD., Windsor House, Victoria Street, Westminster. Manufacturers of and dealers in chemical substances, drugs, dyes, colours, etc. Nominal capital, £10,000 in 5,000 8 per cent. cumulative preference shares of £1 each and 100,000 ordinary shares of 1s. each.

ZINC ALLOY CO. (LONDON), LTD., 91B, Manor Street, Chelsea, London, S.W. Manufacturers of chemical plants. Nominal capital, £2,500 in £1 shares.

ZINC ALLOY RUST-PROOFING CO., LTD., St. George's Ironworks, Crawford Street, Rochdale. Rust-proofers by chemical or any other means, manufacturers of chemical plants, etc. Nominal capital, £2,500 in £1 shares.

### Effective Use of Fertilisers

ADDRESSING the Dartford branch of the Kent Farmers' Union, on February 20, Mr. G. A. Cowie, F.I.C., strongly emphasised the general importance of balancing the fertiliser treatment so as to provide adequate amounts of available nitrogen, phosphates, and potash for the needs of the crop. One of the commonest mistakes made in manuring was using only one kind of fertiliser in cases where a judiciously balanced mixture of the three constituents of plant food was required to give the best results. The production of a good clover plant, which was dependent chiefly on lime, phosphates, and potash, reduced the need of nitrogenous fertilisers, but the clover ley which was generally allowed to depend on the residues of previous manurial treatment in the rotation, often proved unsatisfactory through a deficiency of phosphates or potash, but more often the latter.

Where the use of artificial fertilisers was confined to the root crop, it was important that the phosphate and potash dressings should be made adequate to cover the needs of the other crops in the rotation. The policy, however, which was better suited to intensive cultivation, was to use fertilisers for two or three crops in the rotation, and in correspondingly smaller dressings. In such cases the safest plan was to use as a basis a complete fertiliser which could be modified as might seem desirable to suit particular soil and crop conditions. Both the crop and the soil played a part in determining the manurial requirements.

### Chemical Research at Liverpool

NEW laboratories for inorganic and organic chemistry in connection with the extension of Liverpool University were opened on Saturday, March 3, by Lord Haldane. These were built largely out of funds contributed by industrialists as a result of a recent appeal. The buildings are equipped in the most modern fashion, and it is understood that a considerable section of them will be used for research. In the course of his opening speech Lord Haldane said that although there had been, during the present century, an enormous growth in the working together of science and industry, yet business men still were inclined to stand apart. One never knew in chemistry when a revolutionary discovery might be made. If such a discovery were made he would like to see it in England. We had reached a state of things in which chemical knowledge was going to be the very foundation of prosperity.

### Copper Companies to Merge

THE Esperanza Copper and Sulphur Company has arranged with some of the largest shareholders of the Seville Sulphur and Copper Company to purchase their shares. The present capital of the Esperanza Company is £350,000 in £1 shares. It is proposed to sub-divide each £1 share into seven shares, and that each holder shall surrender to the Esperanza Company four out of every seven shares. The shares will then be consolidated, and 150,000 fully paid £1 shares retained by the shareholders, leaving for the benefit of the company 200,000 surrendered £1 shares. Of these 100,000 will be allotted to the Seville Company for 12,000 shares of £10 each